Model Pollution Prevention Plan

February 1995

U.S. Army Environmental Center
Aberdeen Proving Ground, MD 21010-5401

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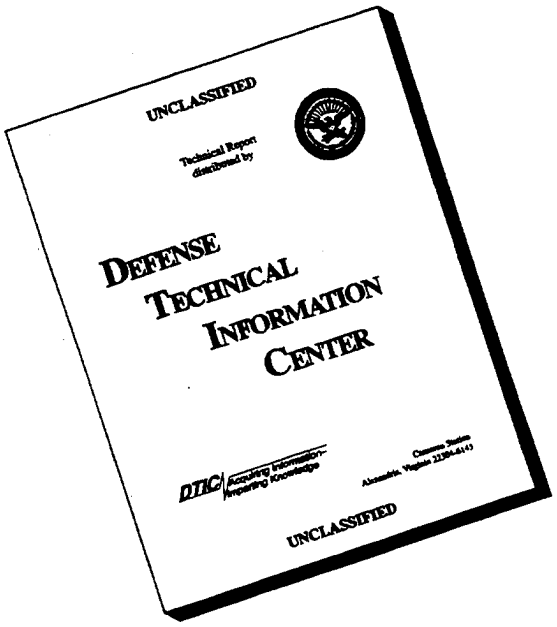

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13. ABSTRACT *(Maximum 200 words)*

The model pollution prevention plan establishes standard methods for setting and meeting pollution prevention goals. Based on EPA guidance, the model plan can be used by all Army facilities. A computer file containing the model plan is available from the Defense Environmental Information Exchange (DENIX) bulletin board system or from the U.S. Army Environmental Center.

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DEPARTMENT OF THE ARMY
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FORWARD

The Army is undertaking major planning efforts and pollution prevention assessments at its installations to meet pollutant discharge reduction goals and comply with Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements."

The Army has developed a Model Pollution Prevention Plan that establishes standard methods to identify and meet pollution prevention goals. Based on U.S. Environmental Protection Agency guidelines, the model plan can be used by industrial and non-industrial facilities for Active and Reserve Components.

A computer file containing the model plan can be downloaded from the Defense Environmental Information Exchange (DENIX) bulletin board system. Future updates to the model plan will be distributed via DENIX.

Pollution prevention planning is an excellent opportunity for installations to demonstrate the Army's continuing commitment to environmental stewardship. I strongly endorse this document and its use at Army facilities.

Raymond J. Fatz
Acting Deputy Assistant Secretary of the Army
(Environment, Safety and Occupational Health)
OASA(I,L&E)

Model
Pollution Prevention Plan

February 1995

CONTENTS

WDCR828/050.WP5

Preface

Introduction

The Army's Model Pollution Prevention Plan (P2 Plan) is a tool for assisting an installation in a comprehensive program for defining responsibilities, developing guidelines, and establishing operating standards in preparing its individual pollution prevention plan.

The main objectives of the P2 plan are to establish standardized methods of doing the following:

- Identifying and tracking hazardous material usage and generation of waste at each of the installation's shops or operations.
- Identifying opportunities for reducing the volume of hazardous material usage and waste disposal through source reduction, recycle, or treatment.
- Identifying a procedure for preparing an implementation plan for the orderly adoption of pollution prevention projects.

Executive Order 12856 targets chemicals that are reportable on the Emergency Planning and Community Right-to Know Act (EPCRA) Section 313 Toxics Release Inventory (TRI), but the installation should focus its initial efforts on the largest material usage or waste streams generated at the installation. The largest streams typically offer the greatest opportunities for reduction.

Model P2 Plan Methodology

The P2 Plan was prepared in accordance with the methodology outlined in U.S. Environmental Protection Agency (EPA) guidance documents. The following specific activities are included as part of the model plan:

- commitment and program implementation
- setting of goals
- baseline inventory
- identification of pollution prevention opportunities
- preparation of an implementation plan
- annual pollution prevention reporting

The activities are described in the following paragraphs.

Commitment and Program Implementation

For a P2 Plan to be effective, it needs top management support in both policy statements and financial resource requests. Pollution prevention needs to be made a part of the

organizational policy. An installation commitment statement and a sample pollution prevention policy statement are included as part of this model P2 plan.

We recommend that the installation designate the Environmental Quality Control Committee (EQCC) or equivalent body to be the policy-setting and decision-making body for pollution prevention for the installation.

Each installation should designate a Pollution Prevention Coordinator who is responsible for facilitating effective implementation, monitoring, and evaluation of the program.

A Pollution Prevention Assessment Team(s) (PPAT) should be formed as needed to assess pollution prevention opportunities. The teams should be temporary, having a specific charter to evaluate a particular waste generation activity, hazardous material usage, or pollution emission from the installation. The primary responsibilities of the Pollution Prevention Assessment Team(s) are to:

- perform pollution prevention opportunity assessments
- present the findings of the assessment to the EQCC or equivalent body for approval and funding
- implement projects approved by the EQCC or equivalent body
- monitor the performance of their pollution prevention projects

The PPAT should include personnel representing key installation functions that contribute to material usage or waste streams targeted for analysis. Other support elements necessary for implementing change in operations to facilitate the reductions also need to be represented. The team should include members who have direct knowledge of the processes that produce waste or other harmful emissions and technical advisors. Technical expertise can be supplemented by outside consultants and by calling on expertise from the following Army technical centers:

- Office of Director of Environmental Programs
- U.S. Army Environmental Center
- U.S. Army Environmental Hygiene Agency
- U.S. Army Environmental Policy Institute
- U.S. Army Acquisition Pollution Prevention Support Office
- U.S. Army Center for Public Works
- U.S. Army Construction Engineering Laboratory
- U.S. Army Armament Research, Development, and Engineering Center
- National Defense Center for Environmental Excellence

Setting of Goals

Each installation must set explicit goals for reducing the use of specific hazardous materials and reducing the volume and toxicity of waste generation within a reasonable time frame. The goals should support the overall goals of the installation's major command and Army-wide goals.

Baseline Inventory

A baseline inventory shall be conducted to identify the waste streams generated and hazardous material usage at the installation and to determine the locations from which each stream originates. The baseline inventory shall be performed on the basis of data obtained from a review of data from industrial hygiene/safety staff (OHMIS/HHIM); the facility's *Biennial Hazardous Waste Report;* the Water and Waste Department's *Hazardous Waste Operations Log* for the RCRA-permitted hazardous waste storage area; DA Form 3917, "Refuse Collection and Disposal"; and DA Form 2788-R, "Facilities Engineering Technical Data," for turn-in of recyclable materials.

Shops identified as major sources of waste or as key components in the installation's handling system for hazardous waste shall be investigated during a site visit. Investigations may consist of interviews with shop supervisors and other personnel, a tour of the shop, and a review of the waste-generating procedures. The information gathered during shop visits can be used for the following activities:

- identifying specific waste-generating processes
- highlighting process efficiencies and inefficiencies
- identifying specific waste problems
- evaluating existing pollution prevention practices
- increasing concern of shop personnel for waste reduction
- questioning the need for use of particular hazardous materials

Information obtained in the baseline inventory shall be used to rank waste streams or material usage for reduction efforts. Ranking normally is based on noncompliance issues first, then on the cost of waste disposal, and finally on the volume of waste generated. Data from the waste audit also will be evaluated to identify the major sources of each type of waste. The results will allow a more narrow focus on the larger waste streams and generators.

Identification and Evaluation of Pollution Prevention Opportunities

A range of pollution prevention alternatives shall be developed and screened for each of the major waste streams and for waste management practices at the installation as a whole. Technological, operational, and managerial pollution prevention alternatives will be identified.

Pollution prevention alternatives that pass preliminary screening will be evaluated further for technical and economic feasibility. Economic analyses will be performed by comparing potential reductions in treatment and disposal costs with the estimated costs of implementing the change. Improvements in working conditions and worker safety also should be considered.

Preparation of an Implementation Plan

An implementation plan shall be prepared to incorporate all pollution prevention alternatives that were found economically feasible and technically practical. The plan shall outline the installation's overall commitment and planned approach to pollution prevention and describe how each of the chosen pollution prevention alternatives will be implemented, demonstrated, or evaluated further.

Annual Pollution Prevention Reporting

Installations have the following reporting requirements that relate to pollution prevention:

- hazardous waste generator biennial or annual report, from RCRA
- annual EPCRA TRI reporting, from EO 12856
- Army Compliance Tracking System (ACTS) hazardous waste disposal and recycling roll-ups, from AR 200-1
- RCS 1383 reporting of programming, budgeting, and execution for all environmental projects, including P2, from AR 200-1
- Army Material Command in its ACTS data call requires its installations to report waste generation and disposal by process category

How To Use This Model Plan

This document has been prepared as a model P2 plan for installations to use in developing their individual plans. The P2 plan is written to be easily adaptable to meet individual site conditions. Instructions for personnel using the plans is marked with shading (''redlining'') in the text. When the individual plan is prepared, the shaded text should be deleted. Information is included that may not apply to a given installation. If a section does not apply, delete it. Additional sections probably will need to be added to reflect the individual waste streams that are significant at a given installation. For your ease, at places in the text where the individual installation name should be used, a general installation name, ''INSTALLATION-XXX,'' is used. When writing the plan using WordPerfect, do a search-and-replace to replace this term with your installation name.

WDCR828/002.WP5

Section 1
Introduction and Regulatory Requirements

Section 1

Introduction and Regulatory Requirements

Introduction

Preventing pollution is **INSTALLATION-XXX**'s top environmental priority. The current emphasis on pollution prevention is necessary to meet state and national pollution prevention policy goals, reduce long-term liabilities of waste disposal, save money by reducing the installation's raw material purchases and waste treatment and disposal costs, and protect public health and the environment.

Pollution prevention is a cost-effective means of meeting environmental objectives in an era when Army installations are simultaneously subject to stricter standards for pollution control, public criticism of their environmental records, and declining budgets. The costs of failing to prevent pollution are dramatically evident; at some installations, cleanup costs are estimated in the hundreds of millions of dollars.

Environmental liabilities increase directly with the volume of hazardous substances and materials in use and increase to a lesser extent as a result of other materials used and the solid waste generated. Reducing these long-term liabilities requires a positive commitment, a sound plan, and an aggressive program for modifying past attitudes toward the conservation of all materials. Reducing liabilities also requires actively searching for opportunities to reduce the amount of waste generated and the use of toxic materials, fuels, and chemicals while still accomplishing **INSTALLATION-XXX**'s mission.

Background

Identify the installation's primary mission clearly. Include in this section information about impacts due to the physical location of the installation: environmental, sociopolitical, cultural, and don't forget environmental justice issues.

Regulatory and Policy Requirements

The Federal Pollution Prevention Act of 1990 was enacted on November 5, 1990. Its purposes are as follows:

- Prevent or reduce pollution at the source whenever feasible.
- Promote recycling if pollution cannot be prevented.
- Permit treatment if pollution cannot be prevented or recycling cannot be implemented.
- Discourage disposal or other releases into the environment.

The Act is not limited to hazardous waste or chemicals subject to Toxics Release Inventory (TRI) reporting under Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA). It also encompasses all hazardous substances, pollutants, or

contaminants. Federal facilities, including Army installations, were included in the requirements of the Act when, in 1993, President Clinton signed Executive Order 12856, setting the Federal Government's policy on pollution prevention. The President noted:

> . . . federal facilities will set the example for the rest of the country and become the leader in applying pollution prevention to daily operations, purchasing decisions and policies. In the process, federal facilities will reduce toxic emissions, which helps avoid cleanup costs and promotes clean technologies.

EO 12856 requires federal facilities to report TRI releases and to set agency goals of reducing TRI reportable releases by 50 percent from a 1994 baseline by 1999. It also requires that federal facilities subject to any of the requirements of EPCRA prepare P2 plans by the end of 1995 that indicate how the facility will support the Agency's P2 goals. Facility P2 plans should include a detailed inventory of waste generation, an analysis of pollution prevention opportunities and options, and a plan for implementing pollution prevention measures.

The Department of the Army (DA) also has issued regulations that stress minimizing the negative effects of the Army's activities on the environment. Army Regulation (AR) 200-1, *Environmental Quality: Environmental Protection and Enhancement*, prescribes DA responsibilities, policies, and procedures for preserving, protecting, and restoring the quality of the environment. AR 200-1 sets the Army's policy for hazardous waste minimization. It requires Army installations to reduce the quantity or volume and the toxicity of hazardous wastes whenever economically practical or environmentally necessary.

This P2 plan is based on current Army guidance and is being used by each installation to comply with the Federal Pollution Prevention Act of 1990; the Superfund Amendments and Reauthorization Act of 1986 (SARA); the Toxic Substances Control Act (TSCA); the Clean Air Act Amendments of 1990; the Clean Water Act of 1987; the Montreal Protocol on Substances that Deplete the Ozone Layer; Executive Order 12856; and DOD Directive 4210.15, *Hazardous Material Pollution Prevention*, dated July 27, 1989. The P2 Plan is framed according to the protocol outlined in EPA guidance manuals, *Waste Minimization Opportunity Assessment Manual* (EPA/625/7-88-003, July 1988), and *Facility Pollution Prevention Guide* (EPA/600/R-92/088). The plan was prepared in accordance with *Guidance to Hazardous Waste Generators on the Elements of a Pollution Prevention Program* (*Federal Register*, May 28, 1993).

Include state and local requirements as necessary or applicable.

Definitions of Pollution Prevention Terms

Under Executive Order 12856, pollution prevention means source reduction and other practices that reduce or eliminate the creation of pollutants through:

- increased efficiency in the use of raw materials, energy, water, or other resources

- protection of natural resources by conservation

The Federal Pollution Prevention Act of 1990 defines "source reduction" to mean any practice that:

- reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) before recycling, treatment, or disposal

- reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants

The term includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, and inventory control.

Under the Act, recycling, treatment, and disposal are not included in the definition of pollution prevention. However, some practices commonly described as "in-process recycling" may qualify as pollution prevention. Examples include solvent recycling using an integral still, continuous filtering of a plating bath, and recovery of volatile organic compounds (VOCs) from degreasing vents. Recycling that is conducted in an environmentally sound manner shares many of the advantages of prevention: It can reduce the need for treatment or disposal and conserve energy and natural resources.

Techniques for pollution prevention fall into six categories: source reduction, in-process recycling, process modification, improved plant operations, input substitutions, and changes in end-product. Before pollution prevention techniques can be used, a waste assessment must be conducted to show where reduction methods implemented by a facility can be most effective. Potential pollution prevention methods then are pinpointed. Pollution prevention requires a multimedia assessment. Transferring pollution from one medium to another does not constitute pollution prevention.

WDCR828/003.WP5

13

Section 2
Commitment and Program Implementation

Section 2

Commitment Goals and Program Implementation

Commitment

INSTALLATION-XXX is committed to reducing the environmental effects of its activities through an active pollution prevention program. In support of this commitment, the installation's pollution prevention policy statement (Figure 2-1) has been prepared and disseminated to all affected individuals in the installation.

Army Pollution Prevention Goals

This subsection will summarize the Army's Pollution Prevention goals and when they are finalized, targeting particular classes of wastes or materials used and how the particular installation is to support these goals, as required by EO 12856.

MACOM Pollution Prevention Goals

This subsection will summarize the MACOM Pollution Prevention goals and when they are finalized, targeting particular classes of wastes or materials used and how the particular installation is to support these goals.

Installation Pollution Prevention Goals

The long-term goal of **INSTALLATION-XXX** is to eliminate the use of hazardous materials, eliminate the generation of wastes, and eliminate emissions of pollutants to the environment (zero discharge). Achieving the goal of complete elimination is recognized as not being technically or economically feasible. Thus, goals have been adopted as interim measures with the ultimate goal of achieving zero discharge (Table 2-1).

Program Implementation

The Pollution Prevention (P2) program at **INSTALLATION-XXX** will be managed in accordance with AR420-47 and AR 200-1. This plan and the policies and procedures established to implement the plan are developed and approved by the EQCC or equivalent. The Pollution Prevention Program is implemented by the Installation's Pollution Prevention Coordinator, with the assistance of Pollution Prevention Assessment Teams as needed to develop, evaluate, and implement specific pollution prevention projects.

Table 2-1
INSTALLATION-XXX POLLUTION PREVENTION GOALS

Waste Type	Subtype	Reduction Goal (%)	Baseline Year	Target Year
Hazardous Waste				
Hazardous Waste	EPA Toxic 17 Wastes			
Hazardous Waste	Solvent Wastes			
Hazardous Waste	Acids and Bases			
Solid Wastes				
Ozone-Depleting Chemical Use				
TRI Reportable Releases		50%	1994	1999

Environmental Quality Control Committee

The EQCC is the policy-setting and decision-making body for pollution prevention at INSTALLATION-XXX. The EQCC will closely coordinate their actions with the installation's Hazardous Waste Management Board (Ref. AR 420-47) to complement actions, not duplicate them. The following list summarizes the responsibilities of the EQCC:

- Brief the installation commander (IC) on all actions necessary or under way to make a pollution prevention program successful.
- Establish overall pollution prevention policies and procedures.
- Establish pollution prevention goals.
- Direct activities of the Pollution Prevention Coordinator.
- Rank the waste streams, processes, or facility areas for assessment.
- Establish priorities for implementation of projects.
- Obtain funding and establish schedule for implementation.
- Monitor or direct implementation progress.

The EQCC or equivalent is chaired by the following individual:

- Insert EQCC Chairperson here

A field grade officer from any major contributor to the installation's waste stream shall be the chairperson of the EQCC.

Figure 2-1
INSTALLATION-XXX
Pollution Prevention Policy Statement

INSTALLATION-XXX is committed to an active policy of protecting the environment in all of our activities. This pollution prevention policy statement is based on our commitment to the following:

- providing a clean and safe environment in our community
- ensuring a safe and healthy workplace for our staff
- complying with all applicable laws and regulations
- efficiently accomplishing our mission
- reducing future liability for waste disposal
- reducing waste management costs

To accomplish these objectives, we will implement programs for reducing or eliminating generation of waste through source reduction and other pollution prevention methodologies. This policy extends to air, wastewater, and solid and hazardous wastes. In addition to meeting the objectives, there are other important benefits related to pollution prevention.

INSTALLATION-XXX is committed to reducing the weight and toxicity of generated wastes. As part of this commitment, **INSTALLATION-XXX** gives priority to source reduction. Where source reduction is infeasible, other pollution prevention methods, such as recycling, will be implemented where feasible. The wastes that cannot be prevented will be converted to useful products or used beneficially, where feasible. Remaining wastes for which no pollution prevention option is warranted will be effectively treated (to decrease volume or toxicity) and responsibly managed. **INSTALLATION-XXX** will select waste management methods that minimize present and future effects on human health and the environment.

Pollution prevention is the responsibility of *all* of our staff. **INSTALLATION-XXX** is committed to identifying and implementing pollution prevention opportunities through solicitation, encouragement, and involvement of all employees.

The EQCC includes the organizations or departments that have significant operational or administrative interest in developing a pollution prevention plan. The EQCC has representatives of the following organizations:

- Directorate of Public Works
- Directorate of Resource Management
- Directorate of Logistics
- Directorate of Contracting
- Directorate of Personnel and Community Activity
- Directorate of Transportation
- Directorate of Industrial Operations
- U.S. Army Medical Activity (MEDDAC)

Additional members of the EQCC could include representatives of Safety and Health; Fire Protection; Preventive Medicine Services; Public Affairs Office; Staff Judge Advocate; Defense Reutilization Marketing Office (DRMO), Finance and Accounting; and Army, Air Force Exchange System (AAFES). An existing council, if qualified, may be used instead of establishing a new board.

Pollution Prevention Coordinator

The Pollution Prevention Coordinator has overall responsibility for the development and implementation of the P2 plan. The Pollution Prevention Coordinator has the responsibility for organizing, implementing, managing, or monitoring the following pollution prevention methods and programs:

- integrating pollution prevention in the installation's comprehensive planning
- preparing and updating baselines for hazardous material use and waste generation
- coordinating the performance of pollution prevention opportunity assessments (PPOAs) to identify and evaluate pollution prevention procedural changes, projects, and equipment
- recommending priorities for funding pollution prevention projects and equipment
- establishing policies for identifying, procuring, and tracking hazardous materials
- developing the installation's pollution prevention training programs

Pollution Prevention Assessment Team(s)

Pollution Prevention Assessment Team(s) (PPAT) will be formed as needed to perform PPOAs. The teams will be temporary, having a specific charter to evaluate a particular waste generation activity, hazardous material use, or pollution emission from the installation. The primary responsibilities of the PPAT are to:

- perform PPOAs
- present the findings of the assessment to the EQCC for approval and funding
- implement projects approved by the EQCC
- monitor the performance of their pollution prevention projects

The PPAT may be led by the installation's Pollution Prevention Coordinator or by a team leader who has a vested interest in the particular waste streams or operations to be investigated.

The PPAT will include personnel representing key installation functions that contribute to material use or waste streams targeted for analysis. Other support elements necessary for implementing changes in operations to facilitate the reductions also will be represented. The team will include members who have direct knowledge of the processes that produce waste or other harmful emissions and technical advisors.

WDCR828/004.WP5

Section 3
Baseline Survey

23

Section 3
Baseline Inventory

A baseline inventory is necessary for two reasons. The quantities of waste generation or toxic material use are assessed to target specific waste streams, materials being used, or activities for pollution prevention. Annual reports on waste generation and toxic material use will be compared with the baseline inventories to evaluate the effectiveness of pollution prevention projects and to monitor progress in achieving **INSTALLATION-XXX's** pollution prevention goals. For facilitating this comparison, the same formats are used for the baseline inventory and annual reports.

Measurements of materials used and wastes generated take into account production levels (such as vehicles maintained or number of soldiers trained), so that P2 is not accomplished solely due to reductions in training or maintenance.

Baseline inventories have been prepared for the following categories and subcategories of waste and material use:

- Hazardous Waste Generation (Table 3-1)
  - Solvent Waste Generation
  - Waste Acids and Bases Generation
- EPA Toxic 17 Waste Generation (Table 3-2)
- Solid Waste Generation (Table 3-3)
- Ozone-Depleting Chemicals (ODCs) Usage (Table 3-4)
- TRI Reportable Releases (Table 3-5)

All data in these tables are reported in annual quantities.

Some categories overlap (e.g., solvent wastes, waste acids and bases, and EPA Toxic 17 wastes also will appear as hazardous waste; some of the EPA Toxic 17 wastes can be solvents). The use of the baseline inventories will assist in developing projects for meeting the pollution prevention goals of **INSTALLATION-XXX**.

This section contains the summary of the Baseline Inventory. Detailed baseline information is in the appendices.

WDCR828/005.WP5

Table 3-1
199_ ANNUAL HAZARDOUS WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
1. Solvent Wastes							
2. Acids & Bases							
3. Wastewater Treatment Sludges							
4. Fuels							

Table 3-1
199_ ANNUAL HAZARDOUS WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
5.							
6.							
7.							
8.							

Table 3-1
199_ ANNUAL HAZARDOUS WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
9.							
10.							
11.							
12.							
TOTAL			**100 %**				

Table 3-2
199_ ANNUAL EPA TOXIC 17 WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
1. Benzene							
2. Cadmium & compounds							
3. Carbon Tetrachloride							
4. Chloroform							

Table 3-2
199_ ANNUAL EPA TOXIC 17 WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
5. Chromium & compounds							
6. Cyanides							
7. Dichloromethane							
8. Lead & compounds							

Table 3-2
199_ ANNUAL EPA TOXIC 17 WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
9. Mercury & compounds							
10. Methyl Ethyl Ketone							
11. Methyl Isobutyl Ketone							
12. Nickel & compounds							

Table 3-2
199_ ANNUAL EPA TOXIC 17 WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
13. Tetrachloroethylene							
14. Toluene							
15. Trichloroethane							
16. Trichloroethylene							

Table 3-2
199_ ANNUAL EPA TOXIC 17 WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
17. Xylene							
TOTAL			**100 %**				

Table 3-3
199_ SOLID WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
1. Aluminum Cans						
2. Corrugated Cardboard						
3. Office Paper						
4. Newspaper						

Table 3-3
199_ SOLID WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
5. Glass						
6. Ferrous Cans						
7. Plastic (PET soft drink bottles, HDPE milk jugs, etc.)						
8. Yard Waste						

Table 3-3
199_ SOLID WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
9. Unclassified Waste						
10. Engine Oils						
11. Engine Coolants						
12.						
TOTAL		**100 %**				

Table 3-4
199_ USAGE OF OZONE DEPLETING CHEMICALS (ODCS)AT INSTALLATION-XXX

ODC Type	Usage (lbs)	% of Total Use	ODC Compound	User/Shop	Process or Operation Using ODC	Usage by Shop (lbs)	% of Type Usage
1. Freons							
2. Halons							
3. Cleaning Solvents							
4. Paint Strippers							

Table 3-4
199_ USAGE OF OZONE DEPLETING CHEMICALS (ODCS)AT INSTALLATION-XXX

ODC Type	Usage (lbs)	% of Total Use	ODC Compound	User/Shop	Process or Operation Using ODC	Usage by Shop (lbs)	% of Type Usage
5.							
6.							
7.							
8.							

Table 3-4
199_ USAGE OF OZONE DEPLETING CHEMICALS (ODCS)AT INSTALLATION-XXX

ODC Type	Usage (lbs)	% of Total Use	ODC Compound	User/Shop	Process or Operation Using ODC	Usage by Shop (lbs)	% of Type Usage
9.							
10.							
11.							
12.							
TOTAL		100 %					

Table 3-5
199_ ANNUAL TOXICS RELEASE INVENTORY (TRI) EMISSIONS FOR INSTALLATION-XXX

TRI Chemical	Code	Release (lbs)	% of Total Release	Generator Unit/Shop	Process or Operation Emitting	Weight by Shop (lbs)	% of TRI Chemical
1.							
2.							
3.							
4.							

Table 3-5
199_ ANNUAL TOXICS RELEASE INVENTORY (TRI) EMISSIONS FOR INSTALLATION-XXX

TRI Chemical	Code	Release (lbs)	% of Total Release	Generator Unit/Shop	Process or Operation Emitting	Weight by Shop (lbs)	% of TRI Chemical
5.							
6.							
7.							
8.							

Table 3-5
199_ ANNUAL TOXICS RELEASE INVENTORY (TRI) EMISSIONS FOR INSTALLATION-XXX

TRI Chemical	Code	Release (lbs)	% of Total Release	Generator Unit/Shop	Process or Operation Emitting	Weight by Shop (lbs)	% of TRI Chemical
9.							
10.							
11.							
12.							
TOTAL			100 %				

Section 4
Pollution Prevention Opportunity Assessment

Section 4
Pollution Prevention Opportunity Assessment

The PPOA enables **INSTALLATION-XXX** to examine the alternatives available for pollution prevention. The modules identify the waste stream and the operation from which the stream may be generated, describe the process, and present several pollution prevention alternatives. Each alternative is described along with its advantages and disadvantages.

INSTALLATION-XXX will use these forms to perform the assessment. Included in Appendix D are sample pollution prevention survey forms. The form should be used by the Pollution Prevention Coordinator or the EQCC as a tool during the survey. The forms contain questions and note areas to examine when interviewing or working with personnel who generate the waste.

The installation will be required to furnish information on the assessment forms. The needed information is the estimated reduction, a technical evaluation, and an economic evaluation. Base personnel will have to describe site-specific conditions so that the amount of reduction possible and the technical and economic feasibility of the alternative can be determined. The information generated by the installation will determine if these alternatives are good pollution prevention opportunities. Personnel performing the PPOA will have to work with the personnel generating the waste to find the best methods for reducing the waste stream.

Assessment modules are included for the following areas or waste streams:

Format Example

The following are P2 examples that typically have been found to work. They should be expanded to include materials listed in the format example. It is important to note that these are example assessment modules and should not be used verbatim. Site-specific information and cost data will need to be generated to assess the suitability and feasibility of each alternative process or chemical for your installation.

- Waste Solvent from Parts Cleaning
- Cleanup Solvents from Painting
- VOC Emissions from Painting
- Scrubber Sludge from Paint Booths
- Liquid Paint-Stripping Waste
- Dry Paint-Stripping Waste
- Battery Acids
- Radiator-Cleaning Waste
- Solid Waste
- Used Oil from Vehicle Maintenance
- Used Oil Filters from Vehicle Maintenance

- Used Antifreeze from Vehicle Maintenance
- Halon Used in Fire Extinguishers
- Freon Used in Refrigeration

WDCR828/006.WP5

52

Pollution Prevention Opportunity Assessment Module
Waste Solvents From Parts Cleaning

Waste Stream: Waste Solvents

Operation: Parts Cleaning

Description

Waste solvents are routinely generated at military facilities during parts cleaning. Parts cleaning typically takes place during maintenance of vehicles and heavy equipment. The waste stream generated during these activities includes liquid waste solvent and degreasing compounds containing unwanted film material, air emissions of volatile solvents, solvent-contaminated wastewater, and solid waste consisting of oil, grease, soil particles, and other film material. There are three common solvent cleaning methods: cold cleaning, vapor degreasing, and precision cleaning. During cold cleaning, the solvent is applied either by brush or by dipping the items in a solvent dip tank. Vapor degreasing uses steam coils for heating the solvent to produce a vapor, and the item to be cleaned is inserted into the vapor region, where the solvent condenses, removes dirt and grease, and drips back into the tank. Precision cleaning flushes the article being cleaned with a solvent.

Alternative 1: Onsite Recycling Using Distillation

Description

Distillation is a recycling method for spent solvents that involves boiling and recovering the solvent. A small amount of sludge remains. The sludge is the dirt and grease from the cleaning process. Distillation reduces the need for offsite transportation and manifesting. Distillation units come in various sizes and types. Small batch-style units would be appropriate for facilities with low solvent usage. Larger units are available that could be centrally located to service several users.

The advantage of onsite distillation is that the facility controls its own hazardous waste. Sending solvents off the site is expensive and requires manifesting of the waste. The disadvantages are that distillation requires labor, energy, cooling water, and maintenance. Solvents that are to be recovered by distillation must be segregated.

53

Prevention Type: Recycling

Estimated Reduction: To be determined by the installation

Technical Evaluation: To be determined by the installation

Economic Evaluation

Investment Cost: To be determined by the installation

Annual Savings: To be determined by the installation

Payback Period: To be determined by the installation

Alternative 2: Off-Facility Recycling

Description

Companies exist that provide the equipment and solvent for parts cleaning. The equipment is rented, and the company is contracted to pick up the spent solvent, supply fresh solvent, and recycle the spent material. The spent material will require a manifest. These units typically are dip tanks.

The advantage of this alternative is that the user does not have to dispose of waste solvents. The disadvantage is that the alternative is subject to the availability of local recyclers, is more expensive than having an in-house unit, is less convenient, and has the added liability of having an outside entity responsible for handling the installation's hazardous waste.

Prevention Type: Offsite Recycling

Estimated Reduction: To be determined by the installation

Technical Evaluation: To be determined by the installation

Economic Evaluation

Investment Cost: To be determined by the installation

Annual Savings: To be determined by the installation

Payback Period: To be determined by the installation

5-4

Alternative 3: Water-Based Cleaners

Description

Aqueous and semiaqueous cleaners are available that may be substituted for solvents. The cleaners can be alkaline or acidic or alcohol-based. The advantage of water-based cleaners is that solvent use can be eliminated. Eliminating solvents will reduce environmental liability and reporting and documentation requirements. The disadvantages are that the effectiveness of water-based cleaners for a specific task

will have to be measured. Water-based cleaning may not be acceptable for all materials or processes. Another disadvantage is that aqueous cleaning still can produce a significant volume of waste that has to be managed and may be classified as hazardous waste because of its contents or pH.

Prevention Type: Product Substitution

Estimated Reduction: To be determined by the installation

Technical Evaluation: To be determined by the installation

Economic Evaluation

Investment Cost: To be determined by the installation

Annual Savings: To be determined by the installation

Payback Period: To be determined by the installation

WDCR828/022.WP5

53

Pollution Prevention Opportunity Assessment Module
Cleanup Solvents From Painting

Waste Stream: Cleanup Solvents

Operation: Painting

Description

Most painting on Army installations is performed by conventional liquid spray technologies. The paint is mixed with a carrier, usually an organic solvent, and is applied to the surface with an air-pressurized sprayer. A major source of waste generated during painting is solvents used to clean painting equipment. Most paints are solvent-based, so they require solvents for cleanup. The solvents used depend on the type of paint used. Some of the more common solvents are methyl ethyl ketone (MEK); xylene; 1,1,1-trichloroethane; toluene; butyl acetate; ethylene glycol; and alcohol.

Alternative 1: Use painting methods that minimize solvent use.

Description

Solvent use can be reduced by changing painting methods. Powder coating or electrostatic dry-powder painting are two methods that minimize solvent use. Dry powder is air-blown onto the equipment, and the equipment is cured in an oven to bond the paint to the substrate. Electrostatic dry-powder painting sprays ionized dry powder onto a surface that has the opposite charge. The major limitation of dry-powder painting is that the items to be painted must be able to withstand the typical curing temperature of 350°F for 30 minutes.

Alternative 2: Use water-based paint when possible.

Description

Water-based paint is used to eliminate the need for solvent cleaners. The disadvantages of water-based paint are that the surface must be free of oil and grease so that the paint will adhere, longer drying times are required, and the transfer efficiency may not be as high as solvent-based paints.

57

Alternative 3: Use specialized cleaning equipment.

Description

Specialized equipment is available for cleaning paint guns and other paint-application equipment. Waste solvents requiring disposal as a hazardous waste can be eliminated.

Alternative 4: Collect and recycle cleaning solvent.

Description

Cleaning solvents can be collected and recycled using distillation. Several companies manufacture small distillation units or batch stills. Solvent can be recovered and reused. The residue from the distillation will have to be disposed of properly, most likely as a hazardous waste.

WDCR828/023.WP5

58

Pollution Prevention Opportunity Assessment Module
VOC Emissions From Painting

Waste Stream: Volatile Organic Compounds Emission

Operation: Painting

Description

Volatile organic compounds (VOCs) are used during painting operations and are emitted to the air. Most painting on Army installations is performed by conventional liquid spray technologies. The paint is mixed with a carrier, usually an organic solvent, and is applied to the surface with an air-pressurized sprayer. One of the largest volumes of waste generated during painting is air emissions. During typical spray painting in a spray booth, 50 percent of the paint is deposited on the surface being painted, and the other 50 percent is sprayed into the air. As the paint dries, the solvent evaporates into the air.

USEPA regulates VOCs emitted from paint coating. Federal VOC limits for paint are 420 g/L for paints that cure below 90°C and 360 g/L for paints that cure above 90°C. Some state air-pollution control agencies are setting strict VOC content limits for paint. For example, the South Coast Air Quality Management District in California has set a 300 g/L VOC limit for general air-dried paints used for coating metal parts and products in fabricating and painting shops. Local regulatory agencies also control VOCs by setting total permissible discharge limits from facilities. The limits include point sources and fugitive sources. The U.S. Environmental Protection Agency is required to develop limits for toxic air emissions. The limits probably will have an effect on both the types of solvents used in paint and those used in cleanup.

Alternative 1: Use painting methods that minimize solvent use.

Description

VOC emissions can be reduced by changing painting methods. Powder coating or electrostatic dry-powder painting are two methods that minimize solvent use. Dry powder is air-blown onto the equipment, and the equipment is cured in an oven to bond the paint to the substrate. Electrostatic dry-powder painting sprays ionized dry powder onto a surface that has the opposite charge. The major limitation in dry-powder painting is that the items to be painted must be able to withstand the typical curing temperature of 350°F for 30 minutes.

Alternative 2: Use paint formulations that minimize or eliminate solvent use.

Description

VOC emissions can be reduced by using high-solid or low-VOC coatings. The coatings contain about 50 to 95% solids. The coatings require special spray equipment for application because of their high viscosity. Surface preparation for reducing the presence of grease or oil is more critical because of less solvent in the paint. In addition, spray application can be wasteful because there is a tendency to apply too much coating to achieve a "wet" appearance similar to that obtained with normal solvent coatings.

Alternative 3: Use water-based paint when possible.

Description

Use water-based paint to eliminate the need for solvents and the resulting VOC emissions. Water-based paint uses a water-based solvent as the carrier. The disadvantages of water-based paint are that the surface must be free of oil and grease so that the paint will adhere, longer drying times are required, and the transfer efficiency may not be as high as for solvent-based paints.

WDCR828/024.WP5

60

Pollution Prevention Opportunity Assessment Module
Paint Booth Scrubber Sludge

Waste Stream: Scrubber Sludge from Paint Booths

Operation: Painting

Description

Most painting on Army installations is performed by conventional liquid spray technologies. The paint is mixed with a carrier, usually an organic solvent, and is applied to the surface with an air-pressurized sprayer. The largest volume of hazardous waste generated in painting involves air emissions that create paint sludge. For instance, during typical spray painting in a spray booth, 50 percent of the paint is deposited on the surface being painted, and the other 50 percent is sprayed into the air. As the paint dries, the solvent evaporates into the air. The air from the paint booth then is exhausted through a water scrubber that separates the paint from the air. The scrubber water normally is recycled, and paint solids are concentrated into a scrubber sump. When the sumps fill, the sludge is removed and put in drums for disposal.

Alternative 1: Use painting methods with higher transfer efficiencies.

Description

The amount of overspray from painting equipment should be minimized. Conventional air-atomized spray painting techniques are very inefficient. Some other coating methods that have higher transfer efficiencies include electrostatic spraying, airless spraying, dip coating, and powder coating.

Alternative 2: Use dry-filter paint booths.

Description

Changing the air-treatment system to dry filters will eliminate the scrubber system. This will reduce water use and potentially the amount of sludge to be disposed of. However, the filters from the system will have to be disposed of. Testing will be required to determine if the filters are hazardous waste.

61

Alternative 3: Use water-based paint when possible.

Description

Water-based paint is used to eliminate the need for solvents and the resulting VOC emissions. Water-based paints use a water-based solvent as the carrier. The disadvantages of water-based paint are that the surface must be free of oil and grease so that the paint will adhere, longer drying times are required, and the transfer efficiency may not be as high as for solvent-based paints.

Alternative 4: Implement better employee operating practices.

Description

Paint-spray systems often are manually operated, so employee training will reduce the amount of paint used and promote waste reduction. Keeping the air pressure low and the spray gun perpendicular to the surface adds several degrees of accuracy to the system by preventing overspray and minimizing sludge in the air-treatment system.

WDCR828/025.WP5

62

Pollution Prevention Opportunity Assessment Module
Liquid Paint-Stripping Wastes

Waste Stream: Liquid Paint-Stripping Waste

Operation: Paint Stripping

Description

Paint stripping is the process of removing paint and paint-type coatings from surfaces, usually as a preparation for inspection, dismantling, reconditioning, or repainting. Solvents or solvent-chemical mixtures are applied to the surface to destroy either the paint coating itself or the coating's ability to stick to the surface. When this process is complete, the residue of paint or solvent is removed from the surface, usually by a pressurized water wash or by scraping. In many instances, the solvent stripper must be reapplied to remove multiple coats or paint that is particularly resistant.

The wastes generated in the stripping process are a significant source of pollutants. The wastes include solvent or paint residue, which can be collected separately, and waste washwater, which contains solids and dissolved chemicals from paints and solvents. Collected solvent or paint residue typically is put in drums and transported to a licensed hazardous waste disposal site. Waste washwater requires treatment in an industrial wastewater treatment plant to remove the paint-stripping solvents (usually phenolic or methylene chloride components) and the metals either in the paint or in the material being stripped.

Alternative 1: Use mechanical methods for removing paint.

Description

A new plastic medium has been developed for blast-stripping painted surfaces without damaging the undersurface. This new material has many advantages over other materials, including engineered abrasive characteristics. It is recyclable, durable, and nonhazardous. The material is constructed of soft plastic formed into rough-edged granular media. Old paint is dislodged using the new media and conventional sand-blasting equipment. The resulting dry waste of pulverized paint and plastic media has significantly less volume and is more readily disposed of than the wastewater produced in solvent-based paint stripping. The plastic medium can be separated from the paint using a cyclone. The medium also can be recycled or reclaimed.

63

One disadvantage is that mechanical stripping is not appropriate for the equipment. Another problem may be that the volume of material requiring paint stripping may not be great enough to justify the capital cost of the system. Advantages include

elimination of solvent use, which results in less environmental liability, lower solvent emissions, and less waste shipped off the site as hazardous waste.

Alternative 2: Use different stripping solution.

Description

Nonphenolic stripping solutions can be substituted for traditional stripping solutions. Substances such as benzyl alcohol can be used to remove paint. Benzyl alcohol is not a regulated substance under SARA. The effectiveness of any substituted product will have to be evaluated. The disadvantage of this alternative is that the effectiveness of the new product must be determined. While eliminating solvent use, the new product may generate more waste than before. If product substitution works, then the liabilities, solvent emissions, and disposal costs associated with traditional paint stripping will be eliminated or greatly reduced.

WDCR828/026.WP5

64

Pollution Prevention Opportunity Assessment Module
Dry Paint-Stripping Waste

Waste Stream: Dry Paint-Stripping Waste

Operation: Paint Stripping

Description

Conventional sand blasting, abrasive blasting, and glass-bead blasting have been used to remove paint and rust from metal surfaces. These techniques cannot be used in many applications, because the abrasive media can damage aluminum or fiberglass surfaces and small or delicate steel parts. In the late 1980s, plastic media blasting was developed and manufactured for blast-stripping painted surfaces without damaging the undersurface. The new material has many advantages over other materials: It is recyclable, durable, and nonhazardous.

Today, spent plastic media are used routinely at Army corrosion-control and paint shops during normal paint- and corrosion-removal activities. Both media are used to remove paint from aluminum and steel vehicles, aircraft, and ground equipment parts. The operation takes place in a sealed booth. The spent media and the paint dust are removed through a vacuum and mechanically sorted. Reusable media are returned to the hopper for reuse; spent (pulverized) media and paint dust are discharged to a drum for disposal. This waste normally is characterized as hazardous because it contains concentrations of chromium, cadmium, and lead.

Alternative: Recycle and Reuse

Description

Plastic media that cannot be recovered through mechanical sorting could be recycled into other products. Vendors may be able to accept the spent material and reprocess the material back into basic plastic materials. Other options include mixing the spent material with paint to create a rough finish where needed, such as for a floor or other surface. Some companies rent the blasting media. When it becomes spent, the vendors take the material back. The vendor then reprocesses or separates the usable material for inclusion as raw materials into other products.

The advantage of recycling is the reduction or elimination of a waste stream. The disadvantages are that vendors may not be readily available or capable of accepting the facility's specific waste stream.

Pollution Prevention Opportunity Assessment Module
Battery Acid from Vehicle Maintenance

Waste Stream: Battery Acid

Operation: Vehicle Maintenance

Description

Battery acid is a main component of lead acid batteries from vehicles. Sulfuric acid typically is used in lead acid batteries. Military installations have a high demand for batteries. There are two typical methods for handling battery acid from dead batteries: (1) draining the battery and neutralizing the acid and (2) shipping the battery to a recycler without removing the acid. Potential environmental and safety problems of battery acid are its corrosive nature and the typically high concentrations of lead. Use of metal equipment during draining operations should be prohibited.

Alternative: Return wet batteries.

Description

If the current operating practice is to drain batteries, explore the opportunities for returning or recycling batteries with the acid still inside. Returning wet batteries eliminates potential environmental problems from draining or treatment. The advantages include elimination of the acid waste stream that contains corrosive waste and lead. The disadvantages may include the limited number of vendors that want to accept batteries containing acid. Wet batteries also will require heated storage areas to prevent freezing and cracking of the batteries. This alternative is more desirable if such a storage area is readily available.

WDCR828/046.WP5

67

Pollution Prevention Opportunity Assessment Module
Radiator-Cleaning Wastes

Waste Stream: Radiator-Cleaning Wastes

Operation: Radiator Cleaning

Description

Spent radiator-cleaning solution must be disposed of as hazardous waste because of its heavy-metal content. Radiators are drained and then cleaned by immersing them in a tank that is covered and heated. The tank is commonly called a "boil-out tank" or a "hot tank." Radiator-cleaning solution, typically sodium hydroxide-based, is prepared from a powdered concentrate and added to the boil-out tank. Depending on use, the radiator-cleaning solution is spent after 3 to 12 months of use. The buildup of dissolved oils and grease causes the solution to become buffered. There usually is no visual indication of a loss in strength, such as buildup of floating oil and grease in the tank. Increased foaming during heating can indicate a loss of strength. The spent solution typically contains up to 50,000 mg/L of lead at a pH of 11 to 12. The spent solution also contains solids, which normally settle to the bottom of the boil-out tank as sludge.

Alternative 1: Minimizing Change-Out of Boil-Out Tank

Description

The manufacturers of the cleaning solution typically state that the minimum change-out frequency is once per year. Depending on the number of radiators cleaned, precleaning procedures, and bath maintenance, however, bath life can be extended to as long as 10 years. Sludge should be shoveled from the boil-out tank weekly, and a maintenance charge of fresh chemical should be added to the bath every 2 weeks.

Bath life also can be extended by minimizing the buildup of oil and sludge by some combination of draining, rodding, flushing, or blowing out radiators before they are inserted into the boil-out tank. Also important is removing as much oil as possible from the oil cooler before insertion of the radiators into the boil-out tank.

69

Alternative 2: Reducing Waste Volume

Description

The volume of waste requiring disposal as a hazardous waste can be minimized by removing the bath and trapping the solids by settling or filtration. The separated liquid can be returned to the tank for reuse. Alternatively, the boil-out tank can be outfitted with a side-stream filter/strainer and pump to remove solids and oil from the bath, thereby minimizing sludge generation and extending bath life.

Another technique is to increase the temperature of the bath, open the bath cover, and evaporate as much of the bath as possible, thereby minimizing the volume for disposal. The sludge may be removed by shovel, and the bath may be reused.

Alternative 3: Replacing Boil-Out Tank

Description

The volume of waste generated may be minimized by modifying or replacing the existing boil-out tank. Consideration should be given to obtaining a smaller-volume boil-out tank capable of processing the same number of radiators. For example, 120-gallon tanks are available for processing up to 64 radiators per day. The dimensions of the cleaning bath must be matched to each radiator's dimensions.

Ultrasonic cleaning tanks that use as low as 50 gallons of cleaning solution also are available.

Alternative 4: Sludge Dewatering

Description

The sludge generated by the boil-out tank probably is heavily contaminated with lead. Disposal cost can be minimized by removing as much water as possible from the sludge. Sludge shoveled from the boil-out tank can be placed into drums and allowed to air-dry over time or can be placed in 5-gallon buckets, allowing the solids to settle before decanting the liquid to the boil-out tank. A cloth or paper filter can be used to separate the liquid from the solids. Sludge also can be dried in drums by using electric band drum heaters.

WDCR828/028.WP5

70

Pollution Prevention Opportunity Assessment Module
Solid Waste

Waste Stream: Solid Waste

Operation: All Base Activities

Description

Solid waste is generated throughout **INSTALLATION-XXX** and is disposed of at to be inserted by installation. A waste audit was performed, and _____ tons of solid waste were estimated as being generated in 19--.

Alternative 1: Modification of Purchasing Practices.

Description

Purchase products that are reusable and durable and that have reduced volume or weight.

1. Require suppliers to ship orders in reusable or returnable packaging, such as wooden pallets and polystyrene peanuts, so that those items can then be reused in **INSTALLATION-XXX** packaging and shipping operations.

2. Install hot-air dryers or cloth-towel rolls instead of using paper towels in restrooms.

Alternative 2: Staff Education

Description

Educate staff to use fewer materials:

1. Use central bulletin boards or computer bulletin boards for memos, reports, and announcements instead of making one copy for each staff member.

2. Use electronic mail.

3. Use double-sided copying.

Alternative 3: Donation or Sale of Usable Materials.

Description

Donate or sell usable materials:

1. Donate leftover and surplus food to a food bank.

2. Identify and donate old supplies to a charity or a school or offer them for sale to staff or to the general public.

Alternative 4: Reduction of Yard Waste

Description

Reduce the amount of yard waste generated:

1. Recycle grass clippings by leaving them on the lawn and allowing them to decompose naturally.

2. Convert clippings, brush, and pruned branches to yard mulch.

Alternative 5: Office Recycling

Description

Reduce the amount of solid waste disposed of:

1. Recycle waste paper by locating recycling bins at copy machines and other locations. Equip each office with a separate container for disposing of waste paper.

2. Recycle aluminum soft drink cans by locating recycling bins in kitchens, lunch rooms, break rooms, and other areas where soft drink machines and refrigerators are located. Provide manual can compactor to reduce volume of waste and quantity of cans that can be stored in the recycling bin.

72

Alternative 6: Residential Recycling

Description

Reduce the amount of solid waste disposed of by segregating the following from the trash for curbside pickup:

1. Newspapers
2. Aluminum Cans
3. Ferrous Cans
4. Glass

Alternative 7: Mixed-Waste Recycling

Description

Mixed-waste or back-end recycling relies on separating recyclables from a mixed-waste stream at a centralized processing facility on the installation or off the installation if recycling is mandatory in the local community. Glass, plastic, aluminum cans, and ferrous cans can be removed from the mixed-waste stream and recycled. Organic materials (food, yard waste, etc.) can be composted. Other remaining wastes can be disposed of in a landfill or incinerated.

1. Newspapers
2. Aluminum Cans
3. Ferrous Cans
4. Glass

WDCR828/029.WP5

73

Pollution Prevention Opportunity Assessment Module
Used Oil From Vehicle Maintenance

Waste Stream: Used Oil

Operation: Vehicle Maintenance

Description

Waste included under this general clarification are lubricating and hydraulic fluids generated from servicing vehicles and other equipment. The major source of waste oil is the used motor oil generated by regular engine oil changes performed at motor pools. Oil changes routinely are performed on a set schedule as determined by Army policy. Standard vehicles receive oil changes every 6 months or 6,000 miles. Special vehicles are serviced every 400 to 600 operating hours. A single oil change can generate anywhere from 6 quarts for a gasoline engine in a typical automobile to 33 gallons for a 12-cylinder diesel engine.

Alternative 1: Motor Oil Testing (to extend life)

Description

Generation of used oil can be reduced by extending the time between oil changes. The current oil change standards are based on service-wide policy. However, the performance characteristics and life of motor oil varies, depending on the conditions under which the equipment is operated.

In an oil analysis program, oil samples are collected at a set interval and are submitted to a field laboratory for analysis. Analyses include a spectrometric test for metals and physical tests for water content, viscosity, and other contaminants.

Alternative 2: On-Board Bypass Filtration

Description

Most internal-combustion engines are equipped with a full-flow oil-filtration system. In this type of system, all of the oil that lubricates the engine first passes through an oil filter. The filter must be quite porous for the oil to pass at the required flow rate, so the filter is designed to remove only relatively large particles (larger than 40 microns) that could seriously damage an engine. Other contaminants that could degrade the oil's protective properties, create sludge, and cause engine wear, such as metals, microscopic dirt and carbon particles, and water, pass through readily.

A bypass filter system consisting of a much less porous element slowly filters a portion of the oil flow (usually less that 1/2 gpm compared with the 4 to 5 gpm that is typical for a full-flow oil filter). Oil is drawn from the bottom of a crankcase,

passed through the bypass filter, and returned to the crankcase. Some bypass filters remove not only solids to the submicron level but also moisture.

Oil analyses have shown that a properly serviced bypass oil filter system can maintain motor oil in a condition where it need not be replaced. These systems have been shown to prolong engine life. Bypass filtration appears to be particularly effective on expensive large engines.

One filter system uses inexpensive paper-towel rolls as filter elements. These filters remove particulate contaminants down to 1 micron and reduce moisture to less than 40 ppm. Filter changes are recommended at 5,000 to 10,000 miles.

Alternative 3: Burning in Space Heaters

Description

Specially designed space heaters are available that can burn used oil and similar waste streams, such as automatic-transmission fluid, with little or no pretreatment. The heat generated from burning the waste oil is used for space heating, saving on disposal costs and lowering heating-fuel costs.

A typical space heater that burns used oil can generate between 150,000 and 500,000 BTU/hour by burning from 1 to 3.6 gallons of oil per hour. The heaters generally are located in a vehicle maintenance facility where the oil is produced.

Federal regulations for burning used oil in space heaters are addressed in 40 CFR 279 Subpart C. On-specification used oil generated on the site can be burned in space heaters without restriction. Off-specification used oil can be burned only if the oil is generated on the site, the heater has a maximum capacity of 500,000 BTU/hour, and combustion gases are vented to the ambient air. Hazardous oil cannot be burned in space heaters.

Alternative 4: Offsite Oil Rerefining

Description

Rerefining involves processing used lubricating oil to return it to virgin oil specifications so that it can be reused as a motor oil. Rerefining involves elaborate and expensive processing and is therefore only feasible as an offsite recycling program, handled either through a broker or directly with a rerefining facility. Current rerefining techniques include filtration, heating, settling, flash dehydration, vacuum stripping, and vacuum distillation.

76

Pollution Prevention Opportunity Assessment Module
Used Oil Filters From Vehicle Maintenance

Waste Stream: Used Oil Filters

Operation: Vehicle Maintenance

Description

Used oil filters are generated during the regular maintenance of vehicles and equipment. DOD establishes the policy that dictates scheduled intervals. Normally, standard vehicles receive oil changes every 6 months or 6,000 miles. Special vehicles are serviced every 400 to 600 operating hours. Oil filters normally are changed as an integral part of the oil change.

Federal regulations covering the disposal of used oil filters are in 40 CFR 261. The regulations require that used oil filters be tested for toxicity characteristics and disposed of accordingly. However, an exemption from testing is provided for non-tin-lead alloy plated used filters that are drained in any of the following ways:

- puncturing the filter and hot-draining for 12 hours
- hot-draining for 12 hours and crushing
- dismantling and draining for 12 hours
- using an equivalent oil-draining method that removes used oil

Alternative 1: Crush filters to reduce volume.

Description

Used filters are drained of as much oil or fuel as possible and then are crushed and disposed of in 55-gallon drums. This can be accomplished in a specially designed filter crusher. Filter draining and crushing is done for several reasons. First, it separates the liquid oil waste from the solid filter to the greatest extent possible. Second, it compacts the filter and allows more filters to be disposed of in each drum, thereby reducing the number of drums and pounds for disposal.

Alternative 2: Recycle off the site.

77

Description

Recycling vendors for oil filters operate in many parts of the country. They process spent filters by shredding them and then separating the paper element from the metal casing. The metal casing is recycled as scrap metal, and the paper is disposed of or burned as a fuel. Most recyclers require that filters be drained for 12 hours and that they not be crushed.

Alternative 3: Separate filter elements and recycle metal.

Description

Oil filters can be cut open, and the paper element can be removed from the casing. The metal casing then can be drained and sold as scrap metal. There is an oil filter element cutter that, like a large can opener, cuts the bottom off the filter casing so that the element can be removed.

WDCR828/031.WP5

78

Pollution Prevention Opportunity Assessment Module
Used Antifreeze From Vehicle Repair and Maintenance

Waste Stream: Used Antifreeze

Operation: Vehicle Repair and Maintenance

Description

Used antifreeze is generated during repair and maintenance of gasoline and diesel engines. Antifreeze becomes a waste when it no longer meets the specifications required to perform its intended purpose (temperature and corrosion protection). Disposal and replacement are rarely based on performance; instead, they are based on engine running time or mileage.

Although antifreeze is not by itself regulated as a hazardous waste, contaminants, such as heavy metals, can make it hazardous.

Alternative 1: Antifreeze Testing (to extend life)

Description

Antifreeze properties that typically would be tested include specific gravity, freezing point, boiling point, pH, general corrosivity, aluminum corrosivity, and foaming. The American Society for Testing and Materials (ASTM) has established standard specifications for properties of antifreeze for automobile and light-duty engines and for heavy-duty engines. The standards and the ASTM test methods used to determine them are shown in Table 1.

Antifreeze testing can be applied through several types of programs. For large engines, such as power generators, when the appropriate laboratory facilities are available, it may be cost-effective to test antifreeze on an engine-by-engine basis. At regular intervals, samples would be collected and tested. Antifreeze not meeting specifications would be replaced, and the used antifreeze would be recycled or disposed of.

A less-extensive program would involve testing antifreeze samples from representative vehicles in a motor pool to establish an average antifreeze life for each vehicle class. On the basis of test results, a schedule for changing the antifreeze of all vehicles in that class would be implemented.

A third type of program would involve changing antifreeze on a regular basis and consolidating and testing the used antifreeze from a number of vehicles. Test results would govern whether the antifreeze would be reused, recycled, or disposed of.

Table 1 ASTM ANTIFREEZE SPECIFICATIONS		
Parameter	**Range**	**ASTM Test Method**
Freezing point °F (°C) (50% volume in distilled water)	-34 (-37)	D 1177
Boiling point °F (°C) (50% volume in distilled water)	226 (107)	D 1120
pH (50% volume in distilled water)	7.5 to 11.0	D 1287
Chloride (ppm)	25 maximum	D 3634
Corrosion in glassware (weight loss, mg/specimen) Copper Solder Brass Steel Cast Iron Aluminum	 10 maximum 30 maximum 10 maximum 10 maximum 10 maximum 30 maximum	D 1384
Corrosion of cast aluminum (mg/cm^2/week)	1.0 maximum	D 4340
Foaming tendency (volume, ml)	150 maximum	D 1881
Source: Reference 8		

Alternative 2: Onboard Recycling

Description

Onboard recycling involves the use of filter systems that are installed on the engine. Antifreeze traveling through the engine cooling system is filtered to remove contaminants that adversely affect its properties. Onboard filtration systems can be either full-flow or bypass. Supplemental coolant additives can be added on a regular basis to replace corrosion and foam inhibitors.

Onboard filtration is particularly effective and often is necessary for long-running heavy-duty gasoline and diesel engines that need antifreeze to be maintained in prime condition to protect expensive components and reduce maintenance cost and vehicle downtime. This technology has been used in this application for more than

25 years. Most engines are not factory-equipped with onboard filters; typically, the filters are installed by the owner. Recommended coolant life can be as long as 240,000 engine miles when onboard recycling is used, compared with 36,000 to 40,000 miles when it is not. Onboard filtration has not been used much on automobiles and light trucks because it is not cost-effective. For small engines, off-board recycling technologies appear to be more useful.

Alternative 3: Antifreeze Recycling

Description

Off-specification antifreeze often can be restored through simple physical processes that remove contaminants and through replacement of chemical additives. Specific recycling methods that are seeing relatively widespread use include:

- standard particle filtration
- ultrafiltration
- distillation

In standard particle filtration, multistage filters in the 5- to 25-micron range are used to remove solids, such as dirt, rust, and suspended metals, that can act as abrasives and cause engine wear. This can be followed up with ion exchange, which removes dissolved metals that cause corrosion, or with aeration/filtration, which removes oils that can affect the freezing and boiling point or increase foaming. Additives usually must be added to precipitate out metals, reduce foam, and restore color. Virgin antifreeze can be added to lower the freezing point.

Several types of standard filtration systems are available in the automotive repair industry. Large stationary fleet-sized treatment units operate in 50- to 100-gal batches. The units can be set up to draw used antifreeze from a feed drum or a small tank, treat it, and discharge the recycled product to a second container. Portable units are available that can be hooked up directly to a vehicle's radiator. With all of these filtration units, filter elements must be replaced regularly and often have to be disposed of as a hazardous waste.

8/ Another type of filtration system for antifreeze recently has been developed at the request of the U.S. Air Force. This relatively simple system uses rolls of household paper towels as elements and can remove particles smaller than 1 micron. The filters can be mounted on a portable skid or trailer and used throughout a maintenance facility to recycle antifreeze that has been collected in containers, or the filters can be attached directly to the engine to provide continuous filtration during engine use.

Ultrafiltration uses a multistage filtration process where the initial filter typically is in the 5-micron range and the final filter is in the 0.001-micron range.

Ultrafiltration is designed to remove molecular-size contaminants, such as sulfates and chlorides, which are the primary causes of corrosion.

There is an ultrafiltration unit that uses 5- and 0.0025-micron filters. This device is reportedly capable of restoring antifreeze to meet all applicable ASTM standards, including corrosion. As with other antifreeze-recycling technologies that use filtration, additives and new antifreeze must be added to restore some properties.

Antifreeze distillation is a two-step process. In the first step, water is distilled under atmospheric pressure. In the second step, ethylene glycol is distilled under a vacuum. The two streams are condensed separately and collected in drums as processed ethylene glycol and distilled water. Dissolved and suspended solids and other contaminants remain in the process vessel and are disposed of. The recycled ethylene glycol then can be mixed with the proper amount of distilled water and additives and can be reused.

A batch-operated still, applicable for use in a maintenance garage, will operate in 15- to 20-gal batches. Each batch takes 10 to 15 hours to treat and generates 0.5 to 1 gal of still bottoms requiring disposal.

WDCR828/032.WP5

82

Pollution Prevention Opportunity Assessment Module
Halon Use in Fire Extinguishers

Waste Stream: Halons

Operation: Portable Fire Extinguishers

Description

Halon ____ is used as a liquid fire suppressant (streaming agent) in portable fire extinguishers. The fire extinguishers are used for To be inserted by installation. Approximately _____ of these units are located throughout INSTALLATION-XXX, containing approximately _____ pounds of Halon. Approximately _____ pounds of halons are emitted during testing of the fire extinguishers.

Alternative 1: Discontinue testing of fire extinguishers containing Halon.

Description

Testing of fire extinguishers containing Halons will be discontinued. Alternative chemicals and methods are available for testing.

Alternative 2: Substitute fire suppressant.

Description

Carbon dioxide, water, dry-chemical, or foam portable fire extinguishers are currently available. Therefore, complete replacement of portable fire extinguishers using halon could be accomplished in the short term.

WDCR828/033.WP5

83

Pollution Prevention Opportunity Assessment Module
Refrigerants (CFCs) from Refrigeration, Cooling-Equipment Maintenance

Waste Stream: Refrigerants (CFCs)

Operation: Refrigeration, Cooling-Equipment Maintenance

Description

Chlorofluorocarbons (CFCs) are used as heat-transfer fluids in the refrigeration cycle of air conditioners, freezers, and refrigerators. The refrigerant remains in a sealed system throughout the refrigeration cycle and is not emitted until the unit is disposed of, although small quantities may leak from the system or be emitted during servicing. The Clean Air Act Amendments require capture and recycling of refrigerants during servicing operation. The Clean Air Act Amendments and DOD Directive 6050.9 require phasing out various CFCs.

Alternative 1: CFC Substitution

Description

Much research has been and is being performed on finding replacements for CFCs. The advantage to CFC replacements is the reduced use of ozone-depleting chemicals. Reducing CFC use will comply with regulatory requirements and DOD directives.

Two problems are associated with CFC substitution. Replacement compounds not requiring retrofitting of equipment are not commercially available, and replacements that are available require equipment modification.

Fluoroiodocarbons recently were announced as true "drop-in" replacements for CFCs. However, these compounds are still undergoing testing and are not expected to be available for commercial use until 1996.

Most of the alternative refrigerants proposed and marketed today require physical retrofits of the equipment and the lubricants. They are less efficient than the CFCs they are replacing, which can lead to the need to replace existing equipment with higher-capacity equipment to accomplish the same level of service.

Substitute refrigerants include the following:

- HCFC-123 or HCFC-124 for CFC-11
- HFC-134a or HCFC-22 for CFC-12
- HFC-125 or HCFC-22 for CFC-502

Alternative 2: CFC Recycling

Description

CFCs, like other solvents, can by recycled through distillation. The CFCs must be removed from the equipment by certified technicians using registered equipment. The CFCs then are reprocessed either on the site or off the site, using distillation technology. The CFCs removed from the equipment will be replaced with recycled CFCs. The advantage of CFC recycling is that it allows continued use of equipment until a suitable CFC replacement is commercially available, and no new supplies of CFCs will have to be purchased. The disadvantage is that DOD is directing the phase-out of ozone-depleting chemicals, so reusing CFCs contradicts regulatory and DOD requirements. The availability of CFC recyclers also may be a hindrance to this alternative.

WDCR828/047.WP5

86

Section 5
Pollution Prevention Implementation Plan

87

Section 5
Pollution Prevention Implementation

The following plan was developed to implement the pollution prevention options that have been determined to be feasible. Pollution prevention projects are separated into three categories:

- Past Pollution Prevention Projects
- Current Pollution Prevention Projects
- Future Pollution Prevention Projects

Current and future pollution prevention projects are summarized in Table 5-1.

The installation should demonstrate management commitment to P2 by giving the dollars spent on P2 and P2 activities in the past and projected expenditures for the future.

In this section, discuss how P2 success has been measured in past efforts and how it will be measured in the future. Note that units of measurement should take into account production levels so that P2 is not accomplished simply by reducing the workload.

In this section, identify barriers expected. Barriers include institutional (mission priorities, MILSPECS), financial, technical, and regulatory. Identify how the installation will find ways to reduce the effect of the barriers during implementation of P2. The following procedures can be tried to overcome the barriers.

Institutional Barriers

Institutional barriers can be overcome by raising the environmental awareness of the troops, civilian employees, contractors, and tenant organizations. Methods of accomplishing this include the following:

- Installation Commander's pollution prevention directives
- Pollution prevention news stories in post newspaper
- Outreach bulletins from environmental groups
- Pollution prevention training
- Clear definition of communication channels between groups

89

Financial Barriers

Financial barriers can be overcome by demonstrating that a pollution prevention project will result in a cost saving. Tools that may help in overcoming economic stumbling blocks include the following:

- Selecting projects with the greatest "bang for the buck"

Table 5-1
INSTALLATION-XXX POLLUTION PREVENTION IMPLEMENTATION PLAN

Project Title	Location	Waste Type	Reduction Expected (lbs./year)	Estimated Cost ($)	Estimated Savings ($/yr.)	Expected Implementation Date	1383 Status
Cardboard Baler	Recycling Center	Solid Waste	400,000	$99,000	$30,000	CY95	Entered

- Using well-defined economic analyses. DOD has guidelines on economic analysis in DOD Initiative 7041 3, "Economic Analysis and Program Evaluation for Resource Management."
- Investigating alternative funding sources - IC's discretionary funds, recycling proceeds, O&M funds

Technical Barriers
Technical barriers can be overcome by attempting the following:

- Include installation's best technical expertise (personnel who operate the processes) during assessment, evaluation, planning, and implementation of P2 options.
- Include other expertise on the installation (civil engineering, logistics, design, maintenance).
- Consult with organizations external to the installation (your major Command, other Commands, Corps of Engineers).

Regulatory Barriers
Typical environmental regulations emphasize control, treatment, and end-of-pipe treatments. It may be difficult to break the thinking of doing only what is necessary to come into regulatory compliance. Try to be proactive and take a multimedia approach. Determine the regulatory effects on all media of implementing a P2 project.

Note awards and incentives offered, both Army-wide (DOD P2 awards) and within the installation. Available awards include the following:

- ASA(FM) has an Army-wide hazardous waste reduction award program.
- Each installation is required to have an incentive award for encouraging and promoting maximum awareness of the installation's P2 program.
- The Secretary of Defense presents an annual award to the DOD installation that has achieved noteworthy improvements in environmental quality in the preceding 2 years. An individual award is given to the military or civilian employee who has made the most significant contribution to the environmental quality program during the preceding 2 years.
- The Secretary of the Army presents an environmental quality award to the individual and the installation that have shown the most noteworthy contributions toward protecting and preserving the quality of the environment during the preceding 2 years (see AR 200-1 for nominating procedures).

93

Past Pollution Prevention Projects

The status of past pollution prevention projects are discussed. Each project will be described to include location implemented, implementation date, targeted waste type (e.g., hazardous waste, EPA Toxic 17 Wastes, ozone-depleting chemicals), actual waste

actual implementation costs, actual savings, and funding sources. The following example is provided for guidance.

Project Title: Paint-Booth Conversion to Dry Filtration

Description: Paint-booth scrubber sludge was eliminated through installation of dry filters. Filters are replaced on a ___ month interval.

Location: Paint booths in Motor Pool _____, Building ____

Implementation Date: December 10, 1993

Targeted Waste Type(s): Hazardous Wastes, Waste Solvents

Waste Reduction: 19,000 lbs/year

Implementation Costs: Parts and Labor: $9,500

Savings: Elimination of the waste stream has saved the installation $6,000 per year in reduced waste disposal cost.

Funding Source: O&M account

Current Pollution Prevention Projects

The status of currently funded pollution prevention projects are discussed next. Each project will be described to include location to be implemented, anticipated implementation date, targeted waste type (e.g., hazardous waste, EPA Toxic 17 Wastes, ozone-depleting chemicals), expected waste reduction, estimated implementation costs, estimated savings, and funding sources. The following example is provided for guidance.

Project Title: Antifreeze Recycling

Description: Used antifreeze from nontactical vehicles is disposed of as a waste, sometimes as a characteristic hazardous waste. Planned equipment is a used-antifreeze filtration system, which will allow used antifreeze to be filtered and returned to the vehicle.

94

Location: Motor Pool _____, Building ____

Implementation Date: CY 1994

Targeted Waste Type(s): Hazardous Wastes, Solid Wastes

Waste Reduction: 5,000 lbs/year

Implementation Costs: $7,200

Savings: Elimination of the waste stream has saved the installation $1,000 per year in reduced costs of waste-antifreeze disposal and drum and drum handling.

Funding Source: O&M account

Future Pollution Prevention Projects

The status of proposed pollution prevention projects is discussed next. Each project will be described to include location to be implemented, anticipated implementation date, targeted waste type (e.g., hazardous waste, EPA Toxic 17 Wastes, ozone-depleting chemicals), expected waste reduction, estimated implementation costs, estimated savings, and funding sources. The following example is provided for guidance.

Project Title: Cardboard Balers

Description: The installation will be able to recycle corrugated cardboard currently disposed of in an off-base landfill. The corrugated cardboard will be collected by Recycling Program employees, baled at the recycling center, and sold.

Location: Recycling Center

Implementation Date: CY 1995

Targeted Waste Type(s): Solid Wastes

Waste Reduction: 400,000 lbs/year

Implementation Costs: $99,000

Savings:	Waste Reduction -	$10,000/year
	Cardboard Sales -	$20,000/year
	Total Savings -	$30,000/year

Funding Source: Capital account

1383 Status: Submitted

WDCR828/049.WP5

Section 6
Annual Pollution Prevention Reporting

97

Section 6
Annual Pollution Prevention Reporting

To assess progress in achieving the installation's pollution prevention goals, the following reports will be generated annually and are in this P2 plan:

- Annual Hazardous Waste Generation Report (Table 6-1)
- Annual EPA Toxic 17 Waste Generation Report (Table 6-2)
- Annual Solid Waste Generation Report (Table 6-3)
- Annual Ozone-Depleting Chemicals (ODCs) Usage Report (Table 6-4)
- Annual Toxics Release Inventory Emissions Report (Table 6-5)
- Annual Pollution Prevention Goals Achievement Report (Table 6-6)

In addition, the following report will be prepared and disseminated to identify the costs of hazardous waste disposal.

- Annual Hazardous Waste Cost Allocation Report (Table 6-7)

The goal of **INSTALLATION-XXX** is to charge individual operations for the costs of managing and disposing of their hazardous wastes.

WDCR828/008.WP5

99

Table 6-1
199_ ANNUAL HAZARDOUS WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
1. Solvent Wastes							
2. Acids & Bases							
3. Wastewater Treatment Sludges							
4. Fuels							

Table 6-1
199_ ANNUAL HAZARDOUS WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
5.							
6.							
7.							
8.							

Table 6-1
199_ ANNUAL HAZARDOUS WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
9.							
10.							
11.							
12.							
TOTAL			100 %				

Table 6-2
199_ ANNUAL EPA TOXIC 17 WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
1. Benzene							
2. Cadmium & compounds							
3. Carbon Tetrachloride							
4. Chloroform							

Table 6-2
199_ ANNUAL EPA TOXIC 17 WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
5. Chromium & compounds							
6. Cyanides							
7. Dichloromethane							
8. Lead & compounds							

Table 6-2
199_ ANNUAL EPA TOXIC 17 WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
9. Mercury & compounds							
10. Methyl Ethyl Ketone							
11. Methyl Isobutyl Ketone							
12. Nickel & compounds							

Table 6-2
199_ ANNUAL EPA TOXIC 17 WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
13. Tetrachloroethylene							
14. Toluene							
15. Trichloroethane							
16. Trichloroethylene							

Table 6-2
199_ ANNUAL EPA TOXIC 17 WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste Code(s)	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
17. Xylene							
TOTAL			**100 %**				

Table 6-3
199_ SOLID WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
1. Aluminum Cans						
2. Corrugated Cardboard						
3. Office Paper						
4. Newspaper						

Table 6-3
199_ SOLID WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
5. Glass						
6. Ferrous Cans						
7. Plastic (PET soft drink bottles, HDPE milk jugs, etc.)						
8. Yard Waste						

Table 6-3
199_ SOLID WASTE GENERATION AT INSTALLATION-XXX

Waste Type	Waste (lbs)	% of Total Waste	Generator Unit/Shop	Process or Operation Generating Waste	Weight by Shop (lbs)	% of Waste Type
9. Unclassified Waste						
10. Engine Oils						
11. Engine Coolants						
12.						
TOTAL		100 %				

Table 6-4
199_ USAGE OF OZONE-DEPLETING CHEMICALS (ODCS)AT INSTALLATION-XXX

ODC Type	Usage (lbs)	% of Total Use	ODC Compound	User/Shop	Process or Operation Using ODC	Usage by Shop (lbs)	% of Type Usage
1. Freons							
2. Halons							
3. Cleaning Solvents							
4. Paint Strippers							

Table 6-4
199_ USAGE OF OZONE-DEPLETING CHEMICALS (ODCS)AT INSTALLATION-XXX

ODC Type	Usage (lbs)	% of Total Use	ODC Compound	User/Shop	Process or Operation Using ODC	Usage by Shop (lbs)	% of Type Usage
5.							
6.							
7.							
8.							

Table 6-4
199_ USAGE OF OZONE-DEPLETING CHEMICALS (ODCS)AT INSTALLATION-XXX

ODC Type	Usage (lbs)	% of Total Use	ODC Compound	User/Shop	Process or Operation Using ODC	Usage by Shop (lbs)	% of Type Usage
9.							
10.							
11.							
12.							
TOTAL		100 %					

Table 6-5
199_ ANNUAL TOXICS RELEASE INVENTORY (TRI) EMISSIONS FOR INSTALLATION-XXX

TRI Chemical	Code	Release (lbs)	% of Total Release	Generator Unit/Shop	Process or Operation Emitting	Weight by Shop (lbs)	% of TRI Chemical
1.							
2.							
3.							
4.							

Table 6-5
199_ ANNUAL TOXICS RELEASE INVENTORY (TRI) EMISSIONS FOR INSTALLATION-XXX

TRI Chemical	Code	Release (lbs)	% of Total Release	Generator Unit/Shop	Process or Operation Emitting	Weight by Shop (lbs)	% of TRI Chemical
5.							
6.							
7.							
8.							

Table 6-5
199_ ANNUAL TOXICS RELEASE INVENTORY (TRI) EMISSIONS FOR INSTALLATION-XXX

TRI Chemical	Code	Release (lbs)	% of Total Release	Generator Unit/Shop	Process or Operation Emitting	Weight by Shop (lbs)	% of TRI Chemical
9.							
10.							
11.							
12.							
TOTAL			**100 %**				

Table 6-6 INSTALLATION-XXX 199_ POLLUTION PREVENTION ACHIEVEMENT REPORT					
Waste Type	**Subtype**	**Reduction Goal (%)**	**Baseline (lbs./year)**	**Current (lbs./year)**	**Achieved to Date (%)**
Hazardous Waste					
Hazardous Waste	EPA Toxic 17 Wastes				
Hazardous Waste	Solvent Wastes				
Hazardous Waste	Acids and Bases				
Solid Wastes					
Ozone-Depleting Chemical Use					
TRI Chemicals					

WDCR828/009.WP5

Table 6-7
199_ ANNUAL WASTE DISPOSAL COST ALLOCATION AT INSTALLATION-XXX

Generator Unit/Shop	Waste Type	Waste Code(s)	Disposed by Shop (lbs)	Unit Cost ($/lb.)	Disposal Cost ($)
1.					
TOTAL For Shop					
2.					
TOTAL For Shop					
3.					
TOTAL For Shop					
4.					
TOTAL For Shop					

Table 6-7
199_ ANNUAL WASTE DISPOSAL COST ALLOCATION AT INSTALLATION-XXX

Generator Unit/Shop	Waste Type	Waste Code(s)	Disposed by Shop (lbs)	Unit Cost ($/lb.)	Disposal Cost ($)
5.					
TOTAL For Shop					
6.					
TOTAL For Shop					
7.					
TOTAL For Shop					
8.					
TOTAL For Shop					

Table 6-7
199_ ANNUAL WASTE DISPOSAL COST ALLOCATION AT INSTALLATION-XXX

Generator Unit/Shop	Waste Type	Waste Code(s)	Disposed by Shop (lbs)	Unit Cost ($/lb.)	Disposal Cost ($)
9.					
TOTAL For Shop					
10.					
TOTAL For Shop					
11.					
TOTAL For Shop					
12.					
TOTAL For Shop					
TOTAL					

Appendices

Appendix A
Abbreviations

AAFES	Army, Air Force Exchange System
AR	Army Regulation
CAAA90	Clean Air Act Amendment of 1990.
COE	Corps Of Engineers
DA	Department of the Army
DEH	Director of Engineering and Housing
DFE	Director of Facility Engineering
DIO	Director of Industrial Operations
DLA	Defense Logistics Agency
DOD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
EO	Executive Order
EQCC	Environmental Quality Control Committee
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act of 1986
FAO	Finance and Accounting Office
FOA	Field Operating Agency
FE	Facility Engineer
GMP	Good Management Practice
GOCO	Government-Owned, Contractor-Operated
HMIS	Hazardous Material Information System
HWM	Hazardous Waste Management
IHWM	Installation Hazardous Waste Manager
IC	Installation Commander
ISCP	Installation Spill Control Plan
MACOM	Major Army Command
MCA	Military Construction, Army
MEDDAC	Medical Department Activity
MWR	Moral, Welfare, and Recreation
O&M	Operation and Maintenance
PPAT	Pollution Prevention Assessment Team
POL	Petroleum, Oil, and Lubricants

PPOA	Pollution Prevention Opportunity Assessment
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act of 1986
SOP	Standard Operating Procedure
SPCC Plan	Spill Prevention Control and Countermeasures Plan
TRI	Toxics Release Inventory
TSCA	Toxic Substance Control Act
TSDF	Treatment, Storage or Disposal Facility
TSG	The Surgeon General
VOC	Volatile Organic Compound

WDCR828/010.WP5

Appendix B
Definitions

Appliance: Any device that contains and uses a Class I or Class II substance as a refrigerant and that is used for household or commercial purposes, including any air conditioner, refrigerator, chiller, or freezer.

Cartridge Filter: A discrete filter unit containing both filter paper and activated carbon that traps and removes contaminants from petroleum solvent, together with the piping and ductwork used in installing this device.

Characteristic Waste: The characteristics of ignitability, corrosivity, reactivity, and toxicity that identify hazardous waste.

Chemical Warfare Agent: A substance that because of its chemical properties is used in military operations to kill, seriously injure, or incapacitate humans or animals or deny use of indigenous resources.

Container: Any portable device in which a material is stored, transported, treated, disposed of, or otherwise handled.

Designated Facility: A hazardous waste treatment, storage, or disposal facility (TSDF) that is identified on a manifest as the destination of a hazardous waste shipment. The facility must have an appropriate permit, have interim status, or be regulated under specific recycling requirements.

Nonattainment Area: Any area designated as being in nonattainment with the National Ambient Air Quality Standard (NAAQS) for ozone pursuant to rulemaking under section 107(d)(4)(A)(ii) of the CAA.

Disposal: The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or onto any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwaters.

133

EPA Hazardous Waste Number: The number assigned by USEPA to each hazardous waste listed in 40 CFR 261, Subpart D, and to each characteristic identified in 40 CFR 261, Subpart C.

Facility: All contiguous land and structures, other appurtenances, and improvements on the land, used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units (i.e., one or more landfills, surface impoundments, or combination of them).

Federally Enforceable: All limitations and conditions enforceable by the Administration, including those requirements developed pursuant to 40 CFR, requirements within any applicable state implementation plan, and any permit requirements established pursuant to 40 CFR.

Generator: Any person or group whose act or process produces hazardous waste identified or listed in 40 CFR 261 or whose act first causes a hazardous waste to become subject to regulations.

Good Management Practice (GMP): A practice that, although not mandated by law, is encouraged to promote safe operating procedures.

Hazardous Waste: A solid waste, not specifically excluded from the restrictions of Federal regulation (42 USC 6901), that meets the criteria listed in 40 CFR 261 or is specifically named as a hazardous waste in Federal regulations.

Household Waste: Includes material discarded by single and multiple residential dwellings, hotels, motels, and other similar permanent or temporary housing.

Incinerator: Any furnace used in the process of burning solid waste for the purpose of reducing the volume of the waste by removing combustible matter.

Infectious Waste: 1. Equipment, instruments, utensils, and fomites of a disposable nature from the rooms of patients who are suspected to have or have been diagnosed as having a communicable disease and who must therefore be isolated as required by public health agencies. 2. Laboratory waste, such as pathological specimens and disposable fomites (any substance that may harbor or transmit pathological organisms). 3. Surgical operating room pathological specimens and disposable fomites attendant thereto and similar disposable materials from outpatient areas and emergency rooms.

Landfill: A disposal facility or a part of a facility where waste is placed in or on land and that is not a land treatment facility, a surface impoundment, an underground injection well, a salt bed formation, an underground mine, or a cave.

134

Hazardous Waste Management: The systematic control of the collection, source separation, storage, transportation, processing, treatment, recovery, and disposal of hazardous waste.

Material-Tracking System: Each generator developing an in-house system to ensure that all hazardous materials and wastes are controlled from purchase to release or disposal in order to reduce loss and spillage.

Medical Waste: When defined as applicable to municipal waste combustors, any solid waste generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in production or testing of biological agents. Medical waste

does not include hazardous waste identified under RCRA-C or any household waste as defined in RCRA, subpart C.

Off-Specification Used Oil: Used oil burned for energy recovery and any fuel produced from used oil that exceeds the following allowable limits:

Arsenic	5 ppm max.
Cadmium	2 ppm max.
Chromium	10 ppm max.
Lead	100 ppm max.
Flash Point	100 °F min.
Total halogens	4000 ppm max.

Particulate Emissions: Any airborne finely divided solid or liquid material, except uncombined water, emitted to the ambient air.

Pollution Prevention: Source reduction and other practices that reduce or eliminate the creation of pollutants through increased efficiency in the use of raw materials, energy, water, or other resources, or protection of natural resources by conservation. Recycling, energy, treatment, and disposal are not included in the definition of pollution prevention. However, some practices commonly described as ''in-process recycling'' may qualify as pollution prevention. Examples might include solvent recycling, metal recovery from a spent plating bath, and recovery of volatile organic compounds (VOCs).

Qualifying Recycling Program: Organized operations that require concerted efforts to (a) divert or recover scrap or waste from waste streams; (b) identify, segregate, and maintain the integrity of the recyclable materials to maintain or enhance the marketability of the material.

Recyclable Material: Material that normally has been or would be discarded (such as scraps and waste) and material that may be reused after undergoing some type of physical or chemical processing. Recyclable materials may include discarded materials that have undergone demilitarization or mutilation at an installation before being transferred to the property disposal office for sale. Recyclable materials do not include (1) precious-metal-bearing scrap; (2) those items that may be used again for their original purpose or functions without any special processing, such as used vehicles, vehicle or machine parts, bottles (not scrap glass), electrical components, and unopened containers of unused oil or solvent.

Recycling: The process by which recovered materials are transformed into new or usable products.

Resource Recovery Facility: Any physical plant that processes residential, commercial, or institutional solid waste biologically, chemically, or physically and recovers useful products (such as shredded fuel, combustible oil or gas, steam, metal, or glass) for resale or reuse.

Sludge: Any solid, semisolid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility exclusive of the treated effluent from a wastewater treatment plant.

Source Reduction: Any practice that reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or emitted to the environment (including fugitive emissions) before recycling, treatment, or disposal. The term includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, and inventory control.

Source Separation: The setting aside of recyclable materials at their points of generation by the generator.

Sump: Any pit or reservoir that meets the definition of tank and the troughs or trenches connected to it that serve to collect hazardous waste for transport to hazardous waste TSDFs, except that as used in the landfill, surface impoundment, and waste pile rules, ''sump'' means any lined pit or reservoir that serves to collect liquids drained from a collection and removal system or a leak-detection system for subsequent removal from the system.

Treatability Study: A study in which a hazardous waste is subjected to a treatment process to determine one or more of the following:

- Whether the waste is amenable to the treatment process
- What pretreatment, if any, is required
- The optimal process conditions needed to achieve the desired treatment
- The efficiency of a treatment process for a specific waste or wastes
- The characteristics and volumes of residuals from a particular treatment process.

136

Treatment: Any method, technique, or process (including neutralization) designed to change the physical, chemical, or biological character or composition of any hazardous waste.

Used Oil: Any oil that has been refined from crude oil or any synthetic oil that has been used and as a result of such is contaminated by physical or chemical impurities.

Volatile Organic Compound (VOC): Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, carbonates, and ammonium carbonate, that participates in atmospheric photochemical reactions.

WDCR828/011.WP5

137

Appendix C
References

ENVIRONMENTAL PROTECTION AGENCY GUIDANCE

General Guidance

Waste Minimization Opportunity Assessment Manual, EPA/625/7-88/003, 1988.
Facility Pollution Prevention Guide, EPA/600/R-92/088, 1992.
Pollution Prevention in the Federal Government: Guide for Developing Pollution Prevention Strategies for Executive Order 12856 and Beyond, EPA/300/B-94/007, 1994.
Pollution Prevention and Right-to-Know in the Government: Executive Order 12856, EPA/100/K-93/001, 1993.
Setting Priorities for Hazardous Waste Minimization, EPA/530/R-94/015, 1994.
A Primer for Financial Analysis of Pollution Prevention Projects, EPA/600/R-93/059, 1993.
Pollution Prevention Act of 1990, Public Law 101-508, 1990.

Industry-Specific Guidance

These guides list source-reduction and recycling techniques for specific industries. The guides have been published by the Pollution Prevention Research Branch of EPA's Office of Research and Development as a series of industry-specific pollution prevention guidance manuals.

Industrial Category	EPA Document No.	Date
Automotive Refinishing Industry	EPA/625/7-91/016	10/91
Auto Repair Industry	EPA/625/7-91/013	10/91
The Commercial Printing Industry	EPA/625/7-90/008	1990
The Fabricated Metal Industry	EPA/625/7-90/006	7/90
Fiberglass Reinforced and Composite Plastics	EPA/625/7-91/014	1991
Marine Maintenance and Repair	EPA/625/7-91/015	1991
The Paint Manufacturing Industry	EPA/625/7-90/005	1990
The Pesticide Formulating Industry	EPA/625/7-90/004	1990
Pharmaceutical Preparation	EPA/625/7-91/017	1991
Photoprocessing Industry	EPA/625/7-91/012	1991
Printed Circuit Board Manufacturing Industry	EPA/625/7-90/002	1990
Research and Educational Institutions	EPA/625/7-90/010	6/90
Selected Hospital Waste Streams	EPA/625/7-90/009	6/90
Mechanical Equipment Repair Industry	EPA/625/R-92/008	1992
Metal Casting and Heat Treating Industry	EPA/625/R-92/009	1992
Metal Finishing Industry	EPA/625/R-92/011	1992

Fact Sheets

The following fact sheets contain overviews, tips, or guidelines for pollution prevention. Some provide only general information or advice on how to set up programs; others identify pollution prevention opportunities for specific industries, processes, or materials. EPA, state agencies, and local governments produced the fact sheets. In many cases, multiple sources have published fact sheets on particular topics. Fact sheets on the topic areas below are available from the EPA library, 401 M Street, SW, Washington DC 20460 (202/260-1963). The source of this information is *Pollution Prevention Resources and Training Opportunities in 1992*, EPA, Office of Pollution Prevention and Toxics and Office of Environmental Engineering and Technology Demonstration, EPA/5650/8-92-002, January 1992.

FACT SHEETS

General and Introductory Information

- *Conservation Tips for Business*
- *General Guidelines*
- *Getting More Use Out of What We Have*
- *Glossary of Waste Reduction Terms*
- *Guides to Pollution Prevention*
- *Hazardous Waste Fact Sheet for Minnesota Generators*
- *Hazardous Waste Minimization*
- *How Business Organizations Can Help*
- *Increase Your Corporate and Product Image*
- *Industrial Hazardous Wastes in Minnesota*
- *Local Governments and Pollution Prevention*
- *Pollution Prevention (General)*
- *Pollution Prevention Fees*
- *Pollution Prevention Training and Education*
- *Pollution Prevention Through Waste Reduction*
- *Recent Publications*
- *Reduce Hazardous Waste*
- *Reuse Strategies for Local Government*
- *Source Reduction Techniques for Local Government*
- *U.S. EPA's Pollution Prevention Program*
- *Video Tapes Available from the Virginia Waste Minimization Program*
- *Waste Exchanges: Everybody Wins!*
- *Waste Exchange Services*
- *Waste Minimization Fact Sheet*
- *Waste Minimization in the Workplace*
- *Waste Reduction Can Work For You*
- *Waste Reduction Overview*
- *Waste Reduction/Pollution Prevention: Getting Started*
- *Waste Reduction Tips for All Businesses*
- *Waste Source Reduction*
- *Waste Source Reduction Checklist*
- *What is Pollution Prevention*
- *Why Reduce Waste?*

Legislative Information/EPA and State Initiatives

- *About Minnesota's "But Recycled Campaign"*
- *Alaska State Agency Waste Reduction and Recycling*
- *EPA's 2% Set Aside Pollution Prevention Projects*

140

- *EPA's "List of Lists" Projects*
- *EPA's Pollution Prevention Enforcement Settlement Policy*
- *EPA's Pollution Prevention Incentives for States*
- *EPA's Pollution Prevention Strategy*
- *Introducing the Colorado Pollution Prevention Program*
- *Michigan's Solid Waste Reduction Strategy*
- *Minnesota's Toxic Pollution Prevention Act*
- *New Form R Reporting Requirements*
- *Oregon's Toxic Use Reduction Act*
- *Pollution Prevention Act of 1990*
- *Promoting Pollution Prevention in Minnesota State Government*

Setting Up A Program

- *1991 Small Business Pollution Prevention Grants*
- *An Organization Strategy for Pollution Prevention*
- *Considerations in Selecting a Still for Onsite Recycling*
- *Colorado Technical Information Center*
- *Onsite Assistance (Colorado only)*
- *Pollution Prevention Grant Program Summaries and Reports*
- *Procuring Recycled Products*
- *Recycling Market Development Program*
- *Selecting a Supplier, Hauler, and Materials Broker*
- *Solid Waste Management Financial Assistance Program*
- *Source Reduction at Your Facility*
- *Starting Your Own Waste Reduction Program*
- *The Alexander Motor's Success Story*
- *The Eastside Plating Success Story*
- *The Wacker Payoff*
- *Waste Reduction Checklists*
  - *General*
  - *Cleaning*
  - *Coating/Painting*
  - *Formulating*
  - *Machining*
  - *Operating Procedures*
  - *Plating/Metal Finishing*
- *Waste Source Reduction: Implementing a Program*

Process/Material Specific

- *Aerosol Containers*
- *Aircraft Rinsewater Disposal*
- *Acids/Bases*
- *Chemigation Practices to Prevent Groundwater Contamination*
- *Corrugated Cardboard Waste Reduction*
- *Demolition*
- *Empty Containers*
- *Gunwasher Maintenance*
- *Lead Acid Batteries*
- *Machine Coolants:*
  - *Prolonging Coolant Life*
  - *Waste Reduction*
- *Metal Recovery:*
  - *Dragout Reduction*
  - *Ion Exchange/Electrolytic Recovery*
  - *Etchant Substitution*
- *Old Paints, Inks, Residuals, and Related Materials*
- *Pesticides:*
  - *Disposal of Unused Pesticides, Tank Mixes, and Rinsewater*
  - *In-Filled Sprayer Rinse System to Reduce Pesticide Wastes*
  - *Pesticide Container Disposal*
  - *Preventing Pesticide Pollution of Surface and Groundwater*
  - *Preventing Well Contamination by Pesticides*
  - *Protecting Mountain Springs from Pesticide contamination*

- *Reducing and Saving Money Using Integrated Pest Management*
- *Metals Recycling*
- *Office Paper Waste Reduction*
- *Plastics:*
  - *The Facts About Production, Use, and Disposal*
  - *The Facts on Degradable Plastics*
  - *The Facts on Recycling Plastics*
  - *The Facts on Source Reduction*
- *Printing Equipment*
- *Refrigerant Reclamation Equipment/ Services*
- *Reverse Osmosis*
- *Safety Kleen, Inc. Users*
- *Shop Rags from Printers*
- *Small Silver Recovery Units*
- *Solvents:*
  - *Alternatives to CFC-113 Used in the Cleaning of Electronic Circuit Boards*
  - *Onsite Solvent Reclamation*
  - *Reducing Shingle Waste at a Manufacturing Facility*
  - *Reducing Solvent Emissions from Vapor Degreasers*
  - *Small Solvent Recovery Systems*
  - *Solvent Loss Control*
  - *Solvent Management: Fiber Production Plant*
  - *Solvent Reuse: Technical Institute*
  - *Trichloroethylene and Stoddard Solvent Reduction Alternatives*
  - *Solvent Recovery: Fiber Production Plant*
  - *Solvent Reduction in Metal Parts Cleaning*
- *Ultrafiltration*
- *Used Containers: Management*
- *Used Oil Recycling*
- *Waste Management Guidance for Oil Cleanup*
- *Water and Chemical Reduction for Cooling Towers*
- *Waste Water Treatment Opportunities*

<u>Industry-Specific</u>

- *Aerospace Industry*
- *Auto Body Shops*
- *Automotive Painting*
- *Automotive/Vehicle Repair Shops*
- *Auto Salvage Yards*
- *Asbestos Handling, Transport, and Disposal*
- *Chemical Production*
- *Coal Mining*
- *Concrete Panel Manufacturers*
- *Dairy Industry:*
  - *Cut Waste and Reduce Surcharges for Your Dairy Plant*
  - *Dairy CEO's: Do You Have a $500 Million Opportunity?*
  - *Liquid Assets for Your Dairy Plant*
  - *Water and Wastewater Management in a Dairy Processing Plant*
- *Dry Cleaners*
- *Electrical Power Generators*
- *Electroplating Industry:*
  - *Dragout Management for Electroplaters*
  - *Plating with Trivalent Chrome Instead of CR+6*
  - *Water Conservation Using Counter Current Rinsing*
  - *Water Conservation: Tank Design*
  - *Water Conservation: Rinsewater Reuse*
  - *What Should I Do With My Electroplating Sludge?*
- *Fabricated Metal Manufacturers*
- *Fiberglass Fabricators: Volatile Emissions Reduction*
- *Machine Toolers*

142

- *Metal Finishers:*
  - *General*
  - *Effluent Minimization*
  - *Rinsewater Reduction*
- *Oil Refiners*
- *Paint Formulators*
- *Paper Manufacturers*
- *Pesticide Formulating Industry*
- *Photofinishers/Photographic Processors*
- *Poultry Industry:*
  - *Poultry CEO's: Do You Have a $60 Million Opportunity?*
  - *Poultry Processor: You Can Reduce Waste Load and Cut Sewer Surcharges*
  - *Survey Shows That Poultry Processors Can Save Money By Conserving Water*
  - *Systems for Recycling Water in Poultry Processing*
- *Printed Circuit Board Manufacturers*
- *Printing Industry*
- *Radiator Service Firms*
- *Shrimp Processors*
- *Steel Manufacturers*
- *Textile Industry:*
  - *Dye Bath and Bleach Bath Reconstitution*
  - *Water Conservation*
- *Wire Milling Operations: Process Water Reduction*

U.S. ARMY GUIDANCE

General Assistance

U.S. Army Construction Engineering Research Laboratory. P.O. Box 4005, Champaign, IL, 61820. 800-USA-CERL.
U.S. Army Cold Regions Research and Engineering Laboratory (CECRL), Hanover, NH 03755-1290. 603-646-4200, DSN 684-4200.
U.S. Army Environmental Hygiene Agency. Aberdeen Proving Ground, MD, 21010. (301) 671-3651 or DSN 584-3651.
U.S. Army Environmental Office. The Pentagon, Washington, DC, 20310-2600, (703) 693-5032 or DSN 223-5032.
U.S. Army Environmental Center (formerly the U.S. Army Toxic and Hazardous Materials Agency). Aberdeen Proving Ground, MD, 21010. 800-USA EVHL, (301) 671-2427 or DSN 584-2427.
U.S. Army Environmental Policy Institute. Champaign, IL, 61820. (217) 373-3320.

143

Pollution Prevention

U.S. Army Environmental Center (formerly the U.S. Army Toxic and Hazardous Material Agency). Environmental Compliance Division. (301) 671-2427 or DSN 584-2427.

Recycling

U.S. Army Engineering and Housing Support Center (USAEHSC). Directorate of Public Works. (703) 704-1606/1601.
Defense Logistics Agency. Check local Defense Reutilization and Marketing Organization (DRMO).

Air Pollution

U.S. Army Environmental Hygiene Agency. Air Pollution Engineering Division. Air Pollution Source Management (301) 671-3500 or DSN 584-3500; or Ambient Air Quality Management (301) 671-3954 or DSN 584-3954.
U.S. Army Environmental Center (formerly the U.S. Army Toxic and Hazardous Material Agency). Environmental Compliance Division. (301) 671-2427 or DSN 584-2427.

CFCs and Halon

U.S. Army Environmental Office. The Pentagon, Washington, DC 20310-2600, (703) 693-5032 or DSN 223-5032.
U.S. Army Environmental Center (formerly the U.S. Army Toxic and Hazardous Material Agency). Environmental Compliance Division. (301) 671-2427 or DSN 584-2427.

Endangered Threatened Species, Natural Resources

U.S. Army Environmental Center. Natural and Cultural Resource Division (703) 355-7968 or DSN 345-7968.
U.S. Army Engineering Waterways Experiment Station (CEWES), Vicksburg, MS 39180-6199, (601) 634-2512, FTS 542-2513.

Hazardous and Toxic Waste and Material Management

U.S. Army Environmental Center (formerly the U.S. Army Toxic and Hazardous Material Agency). Environmental Compliance Division. (301) 671-2427 or DSN 584-2427.
U.S. Army Environmental Hygiene Agency. Waste Disposal Engineering Division. (301) 671-3651 or DSN 584-3651.
Environmental Protection Agency-RCRA/Superfund Hotline. (800) 424-9346.
Environmental Protection Agency-TSCA Hotline. (202) 554-1404

Hazardous Waste Minimization

U.S. Army Environmental Center (formerly the U.S. Army Toxic and Hazardous Agency). Environmental Compliance Division. Army HAZMIN Program. (301) 671-2427 or DSN 584-2427. 144
U.S. Army Environmental Hygiene Agency. Waste Disposal Engineering Division, (301) 671-3651 or DSN 584-3651.

Solid Waste Management

U.S. Army Environmental Hygiene Agency. Ground Water and Solid Waste Management. (301) 671-2024.
U.S. Army Environmental Center (formerly the U.S. Army Toxic and Hazardous Material Agency). Environmental Compliance Division. (301) 671-2427 or DSN 584-2427.

General Environmental/Pollution Prevention

National Defense Center for Environmental Excellence. 1415 Scalp Avenue, Johnstown, PA 15904. 814-269-2432.
Air Force Center for Environmental Excellence, Pollution Prevention Division, Brooks Air Force Base, TX 78235-5318. 210-526-4214, DSN 240-4214.
Navy Energy and Environmental Support Agency (NEESA). Port Hueneme, CA. 805-982-4897.
Annapolis Detachment of the Carderock Division, Naval Surface Warfare Center, Environmental Protection Branch, Craig Alig, Director, 410-267-3526, DSN 281-3526.

Publications

U.S. Army Environmental Strategy into the 21st Century, 1992.
U.S. Army Engineering and Housing Support Center, *Installation Recycling Guide*, 1991.
U.S. Army Environmental Hygiene Agency, *A Commander's Guide to Infectious Waste Management at Army Health Care Facilities*, 1990.
U.S. Army Environmental Hygiene Agency, *A Commander's Guide to Hazardous Waste Minimization at Army Health Care Facilities*, 1990.
U.S. Army Corp of Engineers, *A Commander's Guide to Environmental Management*, 1990.
U.S. Army Corp of Engineers, *Hazardous Waste Management Systems Study*, 1991.
U.S. Army Environmental Center (formerly the U.S. Army Toxic and Hazardous Material Agency), *The Environmental Update*, published quarterly.
Army Environmental Policy Institute, Army Pollution Prevention Plan Manual: A Guide for Army Installations, 1993.
Environmental Health Engineering Directorate. U.S. Army Center for Health Promotion and Preventive Medicine Pollution Prevention Opportunity Assessment Protocol, 1994.

WDCR921/009.WP5

145

Appendix D
Sample Pollution Prevention Survey Forms

This appendix includes forms that are examples of interviews used at other DOD installations in preparing P2 plans. The forms are examples and are not to be used verbatim but to spark ideas and assist in performing a PPOA. Similar assessments of your facility should be included in the appendix to your plan, along with feasibility studies of P2 opportunities that were evaluated.

WDCR828/012.WP5

147

SAMPLE D-1

Pollution Prevention Survey
(insert base name and location)

Date:

Unit Designation, Shop Name, Building:

Type of Operation:

Process Description: Include process flow diagram showing hazardous material usage, wastes, products, and other releases (e.g., air emissions).

Wastes Generated:

-
-

Waste Disposal:

-
-

Releases to Air, Land, or Water From Operation:

-
-

149 **Current Waste Minimization Practices:**

Problems:

-

Waste Minimization Opportunities (In Shop):

-

SAMPLE D-2

Pollution Prevention Survey

Date:

Unit Designation, Shop Name, Building: *Paint Shop*

Type of Operation: *General Painting of Installation*

Wastes Generated:

- Waste paints, paint thinner (mineral spirits, naphtha, toluene, xylenes), and empty 55-gallon paint drums generated from painting post structures and lines on the post's roads and runways and from cleaning painting trucks and equipment (20,106 lbs/year in 1990-91) (D001.,D007, D008, D018, D019, D035, F003, F005). The majority of the waste is nearly empty 55-gallon paint drums.

- Paint-coated gravel from testing and adjusting spray nozzles of the line-painting trucks on a gravel lot behind the paint shop. This practice was stopped in September 1993.

- Building paints are generally water based and generate little to no hazardous wastes.

Waste Disposal:

- Paint and paint-related waste, including paint-coated gravel, is put in drums and disposed of as a hazardous waste.

- Wastes generated from water-based paints are disposed of as nonhazardous wastes in the post landfill.

Current Waste Minimization Practices:

- The paint shop recently switched to ordering traffic paint in returnable 350-gallon Super Drums. The shop used to generate 300 empty drums of waste per year.

- A diked concrete pad has been proposed to be constructed at the shop. The contained area will be used to load and clean the line-painting truck.

Problems:

- Drums of hazardous wastes, paint, and solvent products are stored in areas without secondary containment.
- Paint used in miscellaneous jobs is ordered often in quantities greater than necessary, and excess paint must be disposed of as hazardous waste.

Waste Minimization Opportunities (In-Shop):

- Construct diked areas for storing drums of wastes, paint, and solvent products.
- Revise procedures for changing colors on line-painting truck if possible.
- Consolidate paint wastes in as few containers as possible.
- Order specialty paints in smaller-size containers to prevent waste.
- Rotate stock to prevent exceeding paint shelf life.

WDCR828/038.WP5

152

SAMPLE D-3

Pollution Prevention Survey

Date:

Unit Designation, Shop Name, Building: *Cargo Helicopter Maintenance*

Type Of Operation: *Between-Flight Servicing, Refueling, and Unscheduled Maintenance of Helicopters*

Wastes Generated:

- Fuel-soaked absorbent pads from JP-4 and cleanups of hydraulic-fuel spills (13,900 lbs/year in 1992-93) (D001, D008, other regulated nonhazardous waste). Spills occur during aircraft maintenance and refueling and when temperature increases cause fuel to expand and overtop fuel tanks.

Waste Disposal:

- Used pads are disposed of in metal drums as hazardous waste.

Current Waste Minimization Practices:

- Aircraft fuel tanks are not filled to capacity before being stored in the hangars to prevent overspill from expansion of JP-4.

Problems:

- Pads often are not used efficiently.
- Shop personnel do not like to use foam soak-up pads, preferring fiber pads or rolls.
- Using metal drums to dispose of pads increases disposal weight.
- Maintenance personnel use rolls of pads as one-time disposable drop cloths during aircraft servicing.

Waste Minimization Opportunities (In Shop):

- Supply the shops with both fiber rolls and individual fiber pads for more-efficient use.

- Design fuel-catch pan to attach under unified fuel-control apparatus during maintenance.
- Paint hangar floors with nonskid paint.
- Use large (95-gallon) plastic overpacks rather than metal drums for disposal containers.
- Provide incentives for using pads more efficiently.

WDCR828/036.WP5

154

SAMPLE D-4

Pollution Prevention Survey

Date:

Unit Designation, Shop Name, Building: *Power Plant*

Type of Operation: *Base-Wide Power and Heat Generation*

Wastes Generated:

- Waste oil (fuel, lubricating, and hydraulic) from leaks in diesel feed pumps, turbines, and turbine hydraulic system (2,800 lbs/year in 1992-93) (D001, D018, D019, D029, D039, other regulated nonhazardous waste).
- Spill-cleanup pads, rags, and absorbent material from oil leaks (1,600 lbs/ year in 1992-93) (D001, other regulated nonhazardous waste).
- Fuel oil and Citri-clean from parts cleaning (other regulated nonhazardous waste).
- Hydrochloric and phosphoric acid (700 lbs/year in 1992-93) (D002)
- 1,1,1-trichloroethane from parts cleaning (198 lbs/year in 1992-93) (F001).

Waste Disposal:

- All wastes are collected in 55-gallon drums and disposed of as hazardous waste.

Current Waste Minimization Practices:

- In the process of replacing the turbine hydraulic system, which will reduce or eliminate leaks from that source.

Problems:

- There was an unsuccessful attempt to use a blend of waste oil and JP-4 as a fuel for three of the boilers. The mixture was uncontrolled and was fed into the units without pretreatment.

- The plant has no stack scrubbers. Pollution control is performed by monitoring emissions for carbon monoxide and oxygen and adjusting the boilers when necessary.

- Boilers are fueled primarily by gas and have a backup supply of arctic diesel. EPA is trying to restrict the burning of diesel to 10 percent.

- Additional stack testing (hydrocarbons, NOx, SO_2) would likely be necessary if a greater percentage of diesel or waste oil was to be used for fuel.

- Feed pumps are 35 years old, leak, and need replacing. Leaking oil contains lead from pump bearings.

- Current oil-water separator does not work adequately and therefore is not used.

- Sulfuric acid is supplied in 55-gallon drums that require excessive handling and present opportunities for spills.

Waste Minimization Opportunities (In Shop):

- Replace leaking flanges in fuel-oil lines.

- Construct new oil-water separator and use high-pressure steam/hot water cleaning operation to replace the fuel-oil cleaning of parts.

- Replace the six feed pumps and oil purifiers to reduce leaks. Estimate cost at $70K and $22K per unit, respectively.

- Install 500-gallon tanks for sulfuric acid storage to replace the current use of drums.

- Use waste oil, diesel, and JP-4 as a fuel mixture in one or more of the boilers. Fuel and oil first would have to be blended and treated.

SAMPLE D-5

Pollution Prevention Survey

Date:

Unit Designation, Shop Name, Building: Hazardous Waste Storage Area

Type of Operation: *RCRA and TSCA Regulated Waste Storage Facility*

Wastes Generated:

- This shop is a RCRA and TSCA permitted facility that collects all hazardous wastes generated on the post as well as waste from other DOD facilities throughout Alaska.

- This shop also is used as a consolidation point for used oil from other nearby DOD facilities (970,000 lbs over a 2-year period) (D001, D018, D029, D039, F001, F003, other regulated nonhazardous waste).

- Solvent-contaminated soil from the cleanup of a past recurring spill at a waste-solvent drum-storage area near Building 6 (110,000 lbs as of 9/10/91; the cleanup is still under way) (D018, F005). The storage area had been operated by a tenant organization. They have improved their storage practices.

Waste Disposal:

- Used oil is being stockpiled on the site in railroad tank cars. The majority of the oil is off-specification, nonhazardous material. Some contains hazardous concentrations of solvents or metals.

157

- Hazardous wastes are shipped through a contractor to the lower 48 states, where they are incinerated or otherwise treated and/or landfilled.

Current Waste Minimization Practices:

- Used to send used oil off the site, where it was mixed with coal and burned in the power plant. Because of improper handling, the State no longer allows this practice. The oil is being stockpiled at the base in railroad tank cars.

- Converting several shops to use Black Gold furnaces that will burn up to 100 gpd of used oil to generate heat.

- Accumulation points for hazardous waste are in some instances housed in specialized storage sheds.

Problems:

- Waste oils sometimes contain hazardous concentrations of metals, organics, and solvents.
- Often, drums of waste paint are received from the paint shop 90 percent empty, and drums of cleanup pads are received light (dry and unused). A good portion of the disposal costs in these instances is for the weight of the drum.
- Large plastic overpacks are difficult to handle and store.

Waste Minimization Opportunities (In Shop):

- Better use of cleanup pads and lighter drums would lessen disposal costs.
- Burn waste oil and JP-4 as a fuel in the existing base power plant.
- Construct an incinerator or a separate power facility for burning waste oil and solid waste.
- Install additional Black Gold furnaces for heating buildings using waste oil.

WDCR828/039.WP5

158

SAMPLE D-6

Pollution Prevention Survey

Date:

Unit Designation, Shop Name, Building: *Transportation Company*

Type of Operation: *Stripping and Painting of Vehicles*

Wastes Generated:

- Methyl ethyl ketone (MEK) paint thinner and waste paint from cleaning painting equipment (~4,500 lbs/year in 1990-91) (D007, D008, F005).

- Plastic paint-stripping media are used to remove old paint from aluminum aircraft parts (soft, Type II media) and steel ground equipment parts (hard, Type III media). Spent beads and paint residue are collected and disposed of (27,200 lbs/year in 1990-91) (D006, D007, D008).

- Glass beads from stripping corrosion from steel parts. Spent beads and corrosion residue are disposed of (~9,000 lbs/year in 1990-91) (other regulated nonhazardous waste).

- Spent Turco (cold solvent) paint stripper and rinse water are generated from spot-stripping paint, particularly Boeing primer, from thin parts that cannot be stripped with plastic media. Turco is hand-applied with brushes. In addition, spent fine organic 606 (hot solvent) paint stripper and contaminated rinse water are generated from a dip tank stripping process used to remove paint from small parts (8,300 lbs/year in 1990-91) (D002, D007, D008, F001, F002, F003, F005).

- Used filters and paint-booth paper are generated from two dry paint booths (1,500 lbs/year in 1990-91) (D007, D008, other regulated nonhazardous waste).

159

Waste Disposal:

- MEK and waste paints, spent plastic stripping media, spent Turco, and organic 606 paint stripper and rinse water are collected in drums and disposed of as hazardous waste.

- Glass stripping beads and air filters have been disposed of in the past as hazardous waste but recently have tested as nonhazardous and have been disposed of in the base landfill.

Current Waste Minimization Practices:

- Plastic-media stripping process was installed in June 1990 and has greatly reduced the use of Turco stripping and the total waste generated from parts stripping.

- Paint booths recently were switched over from wet to dry filter. This has eliminated a 3,000 gallon/week waste stream of water.

Problems:

- Plastic media break down and create hazardous wastes because of metals from paint residue.

- There is no system set up for reusing MEK paint thinner.

- Paint shop foreman is concerned about using a still to recycle MEK. He feels that the recycled (off-spec) MEK may be used inadvertently to mix paints.

Waste Minimization Opportunities (In Shop):

- Switch to water-base paints, thereby eliminating the need for MEK. In the long term, use of hazardous paint strippers would be eliminated, and spent plastic media could be disposed of as nonhazardous waste.

- Recycle spent plastic beads.

- Install a still for recycling spent MEK.

- Use CO_2 paint stripping.

- Use organic-media paint stripping.

160

WDCR828/040.WP5

SAMPLE D-7

Pollution Prevention Survey

Date:

Unit Designation, Shop Name, Building: *Company Motor Pool*

Type of Operation: *General Motor Pool Maintenance and Repair*

Wastes Generated:

- Motor oil (3,000 lbs/yr in 1992-93) and oil filters (5,900 lbs/yr in 1992-93) from regular vehicle maintenance. Oil is changed every 6 months or 6,000 miles on standard vehicles and every 400 to 600 operating hours on special vehicles. Approximately 1,300 vehicles are serviced. These quantities include wastes generated at the Heavy Equipment Maintenance Shop (D001, other regulated nonhazardous waste).

- Antifreeze from regular vehicle maintenance (700 lbs/yr in 1992-93) (other regulated nonhazardous waste).

- Waste paint and related materials from painting fleet vehicles in two wet paint booths (1,800 lbs/year in 1992-93) (F005).

Waste Disposal:

- Used oil is being consolidated in a waste POL sump and tanks.

- Oil filters, used antifreeze, and waste paint and related materials are disposed of as hazardous waste.

- Solvents are disposed of by Safety Kleen.

Current Waste Minimization Practices:

- The floor of the garage is swept daily with a dry sweeping machine to eliminate dirt accumulation in the oil-water separators.

- Oil filters are crushed before disposal.

- Citrus (orange peel) solvent has been replacing PD-680.

- A test (litmus) for evaluating antifreeze has been implemented that has extended the life of antifreeze from 2 to 4 years.

- Diesel fuel is tested and reused if possible.

- A dry-filter, down-draft work area has been installed and is used for bodywork, such as sanding and touch-up painting.

Problems:

- Shop supervisor does not like the idea of recycling antifreeze.

- Synthetic motor oils are not acceptable to the Army because they may void vehicle warranties.

- This shop has been designated as an area to receive two Black Gold furnaces. Shop supervisor foresees a problem with open flames in his building. Furnaces would have to be located in a separate building if they operate with open flames.

- Shop supervisor feels that waste management requires a full-time supervisor and a dedicated staff, which he does not have.

Minimization Opportunities (In Shop):

- Institute a program for testing motor oil and antifreeze to increase the time between changes.

- Switch from wet to dry paint booth.

WDCR828/041.WP5

162

SAMPLE D-8

Pollution Prevention Survey

Date:

Unit Designation, Shop Name, Building: *Transportation Company, Heavy Equipment Maintenance*

Type of Operation: *Maintenance and Repair of Heavy Snow-Removal Equipment and Other Heavy Vehicles*

This shop is operated under the motor pool maintenance department

Wastes Generated:

- Motor oil, oil filters, and antifreeze from regular vehicle maintenance. Oil is changed every 4 to 6 months or 200 to 400 hours of vehicle running time; 300 vehicles are serviced, some needing as much as 132 quarts of oil per change. The quantities of used oil and filters generated at this shop are included in those listed.

- PD-680 degreaser from cleaning vehicle parts (2,000 lb/year in 1992-93) (D001).

- Contaminated diesel is generated when trucks are drained before overhaul (other regulated nonhazardous waste).

Waste Disposal:

- Used motor oil is being consolidated in 55 gallon drums.

- Used oil filters are disposed of in drums as hazardous waste.

- Spent PD-680 is disposed of in drums as hazardous waste.

163

Current Waste Minimization Practices:

- Used oil filters are crushed and drained before disposal.

- If diesel fuel is not contaminated, it is reused.

Problems:

- Synthetic motor oil is not acceptable by the Army because its use may void vehicle warranties.

Waste Minimization Opportunities (In Shop):

- Institute a testing program for motor oil to increase the time between changes.
- Use high-pressure hot water or detergent wash rather than a degreaser to clean parts. Treat washwater in an oil/water separator.
- Filter PD-680 for reuse (may already be doing this).

WDCR828/042.WP5

164

SAMPLE D-9

Pollution Prevention Survey

Date:

Unit Designation, Shop Name, Building: *Transportation Company, Diesel Maintenance*

Type of Operation: *Diesel Generator Teardown and Rebuild*

Wastes Generated:

- Used motor oil and diesel fuel in unknown condition are generated when diesel generators are drained before teardown (1,000 lbs/yr in 1992-93) (D001, other regulated nonhazardous waste).

Waste Disposal:

- Used motor oil is put in drums and disposed of as waste.
- Diesel fuel is reused if possible or disposed of as waste.

Current Waste Minimization Practices:

- Diesel fuel is tested for water content and reused if possible.

Problems:

- In the past, generator parts were cleaned with tetrachloroethylene (PCE) and then rinsed off down the building floor drains. The shop received a notice of violation from EPA for this practice. Parts are currently cleaned at Fort Richardson, but this is an unacceptable practice because of the delays involved. New procedures are being investigated.
- There is no Army-approved method for testing motor oil for reuse.

165

Waste Minimization Opportunities (In Shop):

- Institute a testing program for motor oil to determine if it can be reused.

- Potential alternatives for parts-cleaning technologies are:

  - High pressure steam or hot water
  - Alkaline cleaning system

WDCR828/043.WP5

SAMPLE D-10

Pollution Prevention Survey

Date:

Unit Designation, Shop Name, Building: *Public Works, Operating Engineers*

Type of Operation: *Hazardous Waste and Materials Response*

Wastes Generated:

- Various wastes are generated from emergency response cleanup actions at off-post locations. Examples of wastes generated and sent to the RCRA storage facility in 1992-93 include asphalt cutback (4,600 lbs), waste oil (9,700 lbs), and PCB-contaminated material (1,200 lbs).

- Waste diesel fuel, antifreeze, transmission fluid, etc., from maintenance of shop vehicles.

Waste Disposal:

- Nonhazardous waste oil is being stockpiled at the base in railroad tank cars.

- Other wastes are placed in drums and disposed of as hazardous waste.

Current Waste Minimization Practices: None

Problems:

- Little can be done to minimize waste at the source because most wastes originate off the site and are a result of cleanup activities.

Waste Minimization Opportunities (In Shop):

167

- Institute a testing program for motor oil and antifreeze to increase the time between changes.

WDCR828/044.WP5

SAMPLE D-11

Pollution Prevention Survey

Date:

Unit Designation, Shop Name, Building: *Defense Reutilization and Marketing Office (DRMO)*

Type of Operation: *Hazardous and Nonhazardous Material Collection, Storage, Redistribution, and Sale.*

Wastes Generated:

- DRMO is a consolidation point for unused products from military installations throughout the state. The wastes are those that have exceeded their shelf life or are no longer needed by the original purchaser. DRMO tries to find other uses for them. Materials include:

  - Paints
  - Sulfuric acid
  - Cleaners
  - Adhesives
  - Petroleum products
  - Chemical DECON kits

- DRMO spent approximately $3.6 million on disposal of materials received from Army installations in 1992.

Waste Disposal:

- Where possible, materials are sold or given away for reuse. Remaining materials are disposed of as hazardous waste through a RCRA-permitted hazardous waste storage area.

169

Current Waste Minimization Practices:

- Try to resell or reuse products.

Problems:

- Many items are received without MSDS sheets. They cannot be reused and must be analyzed before disposal.

Waste Minimization Opportunities (In-Shop):

- Shops should obtain MSDS sheets with purchases of all chemical products and should keep MSDS sheets with products even during disposal.

- Shops need to rotate stock so that shelf lives are not exceeded, and shops should limit purchases to the amount needed.

- Shops should use proper storage to keep materials longer.

WDCR828/045.WP5

170